A CONFERENCE
UNDER THE SPONSORSHIP OF
THE DEPARTMENTS OF AGRICULTURE
NORTHERN AFFAIRS AND
ECONOMIC DEVELOPMENT AND TOURISM

IN CONJUNCTION WITH
NORMAN REGIONAL DEVELOPMENT CORPORATION

THE NORTH FEEDING THE NORTH

Results of seminar held September 4,
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The Pas, Manitoba

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INTRODUCTION

1. PURPOSE

On Thursday September 4, 1980, and Friday September 5, 1980, a conference entitled "The North Feeding The North" was held in The Pas, Manitoba. The purpose of the conference was to examine the possibilities of researching and developing new food production opportunities in Manitoba north of the 53rd parallel, and to expand those agricultural enterprises that already exist.

SEMINAR FORMAT

The seminar format included the following:

Opening remarks by the Lieutenant Governor of Manitoba, Hon. F.L. Jobin.

Speeches by the following:

Name	Position	Point of View
Bob Smith	Head of Canada- Manitoba Soil Survey Dept. of Soil Science	"LAND"
Paul Rennick	Head of Environmental Group, Acres Consulting Services Ltd.	"WATER"
Hugh Fraser	Chief of Scientific Surfaces Environment Canada	"WEATHER"
Ron Britton	Associate Professor Dept. Agricultural Engineering University of Manitoba	"WHAT"
Wayne Fraser	Director Safety and Environment Hudson Bay Mining and Smelting Co. Ltd.	"WHERE"
Ellen Heale	Agriculturist Inco Metals Company	"WHERE"
Daryl Kraft	Associate Professor of Economics and Farm Management University of Manitoba	"WHEN"

Bob Harris	Research Scientist Agriculture Canada Sidney, B.C.	"WHY"
Worth Hayden	Director of Fisheries Dept. Natural Resources Province of Manitoba	"INVENTORY"
John Bodner	Former Manager Co-op Fisheries Ltd. The Pas	"COMMERCIAL"
Stu Law	Director Fisheries and Freshwater Fish Institute	"PROCESSING"
Burton Ayles	Agriculture Freshwater Fish Institute	"HATCHING AND FARMING"
George Vercaigne	Producer Brandon	"HOGS"
Joe Tsukomoto	Agrologist Dept. Agriculture Prov. of Manitoba	"FORAGING"
Bob Richmond	Agrologist Dept. Agriculture Kamloops, B.C.	"DOMESTICATION of WILDLIFE"
Blake Donahoe	Donahoe Farms Ltd. Brandon & The Pas	"DAIRY"
Karen Wittenburg	Dairy Specialist Dept. Agriculture Prov. of Manitoba	"GOATS"

THE FUTURE

Paul Rennick	Head of Environmental Group Acres Consulting Services Ltd. Niagara Falls, Ont.	"LAND, WATER, WEATHER"
Ron Britton	Associate Professor Dept. Agricultural Engineering University of Manitoba	"GREENHOUSE AND HORTICULTURE"
Burton Ayles	Agriculture Freshwater Fish Institute	"FISH"
Bob Richmond	Agrologist Dept. Agriculture Kamloops, B.C.	"MEAT, DAIRY, FORAGE"

SUMMATION

Bob McGinnis	Dean, Faculty of Agriculture University of Manitoba

RESOLUTIONS

BIOGRAPHIES

Ellen L. Heale

Miss Ellen L. Heale is a native of the Sudbury area. She graduated from university in 1976, attaining her B.Sc. (Agr.) from the Ontario Agricultural College at the University of Guelph.

During her undergraduate years, she worked as a summer student for the Inco Agriculture Department. She rejoined the company again, after graduating in 1976, as the Horticulturist.

Miss Heale continued her studies, graduating with her M.Sc. in Environmental Physiology in 1980 from the Department of Horticultural Science at the University of Guelph.

Stan Wilson

Stan Wilson, 41, was born in The Pas and has remained there most of his life with the exception of leaving to continue his post-secondary education.

Born on The Pas Indian Reservation, he was the eldest of five children in his immediate family, plus six cousins who, within the Cree kinship structure, were adopted as brothers and sisters when their own parents died.

Stan has spent his preschool days on the trapline with his family, moving in accordance with his father's seasonal work.

His early education was spent in The Pas and later in Prince Albert, Saskatchewan.

Following his preliminary education he took teacher training from the Saskatchewan Teachers' College in Saskatoon and later received his Bachelor of Arts from the University of Saskatchewan in 1968. From there he went to the University of California in Santa Barbara for his Master of Arts in Confluent Education, completing his Doctorate in 1975.

His teaching experience ranges from Shoal Lake, Moose Lake, Cranberry Portage, Minnedosa and The Pas to Brandon as a university professor, education consultant for the Manitoba Department of Education and teaching assistant at the University of California.

Wilson has participated in a variety of workshops and seminars over the years, mainly in the realms of education, communications and native awareness. He published the "Opasquiak: The Pas Indian Reserve" in 1971, which is used as a supplement to the Grade 5 social studies unit for Manitoba.

He has been involved with the National Indian Educators of St. Paul, Minnesota, president on the Canadian Confluent Education Development and Research Centre in Winnipeg, member of the International Advisory Board on Confluent Education Development and Research in Santa Barbara, and associate of the Western Centre for Gestalt Learning in Calgary.

Within the community Wilson has been the chairman of the board of directors of the Information Communication Program for Northern Affairs and vice president of the Otineka Development Corporation.

He still serves as a councillor for The Pas Indian Band, chairman of The Pas Indian Band Education Committee, school trustee of Kelsey School Division and advisory board chairman of the Northern Nursing Programme of Keewatin Community College.

For the most part, Wilson is a cattle rancher with a successful registered Aberdeen Angus cow/calf operation on The Pas Reserve with his wife Peggy and their three children.

He is currently working on a three month contract with The Pas Indian Band to develop an alternative junior high school in The Pas plus establish a total reserve learning centre.

Robert E. Smith

Robert (Bob) Smith is the head of Canada-Manitoba Soil Survey with the Department of Soil Sciences at the Unversity of Manitoba.

His career started in 1956 when he accepted a position as agriculturist IV and did soil surveys of selected areas of Manitoba.

Between 1963 and 1968, he was the field supervisor of soil survey parties with CDA Research Station in Winnipeg. Between 1968 and 1973, he was head of the pedology section at the same research station.

From 1973 to 1978, Bob was the head of the Winnipeg Soil Survey Unit with the Soils Research Institute, CDA.

Since 1978, he has headed the Winnipeg Survey Unit with the Land Resource Research Institute. He has directed and managed the integrated federal-provincial soil survey project in Manitoba since 1968. He integrated federal-provincial soil survey projects in Manitoba since 1968. Staffs of the Manitoba Department of Agriculture and currently the Land Resource Research Institute of CDA conduct a comprehensive program of soil resource inventory and land evaluation for biological uses including agriculture, forestry and wildlife.

Bob has also been a member of the uses committee with the International Garrison Diversion Study Board.

He has been an adjunct professor with the Department of Soil Science, University of Manitoba, since 1970 and is closely associated with the graduate studies program of the department.

In addition, he has authored and co-authored approximately 15 soil survey reports and several technical papers regarding soil classification and characterization.

Paul H. Rennick

Paul H. Rennick is head of an environmental group with Acres Consulting Services Ltd. in Niagara Falls, Ontario. He presented the "Water" portion of the panel on the first day of the seminar.

In his present position, Paul is responsible for overall technical input for environment and resource planning on projects and administration of professional staff.

His education includes a bachelor of science in forestry from the University of New Brunswick and a master's degree in regional planning and resource development from the University of Waterloo. He has also completed a graduate course in ecological land use planning. Following university, he was a concession forester for two years with Ontario Minnesota Pulp and Paper Co. in Kenora, where he did pre-engineering for road location, forest inventory and silviculture.

Between 1962 and 1964, he worked for the Ontario Forestry Association as editor of the Tree Farmer magazine, conservation lecturer to schools and groups throughout Ontario and secretary of Ontario Tree Farm Association.

Between 1964 and 1974, he worked in various capacities with the Ontario Ministry of Natural Resources including senior planner, district planner and farm forester.

In 1974 he moved to Alberta with the department of energy and natural resources, where he served as head of the land-use assignment section and manager of the integrated management planning section.

He joined Acres Consulting Services in 1978 and served as senior project supervisor for environmental and special studies division before becoming head of the environmental department in 1979.

Paul has authored several technical publications and occasional papers. His most recent paper, "Getting results from the environmental assessment process", was presented at the annual meeting of Road and Transportation Association of

Canada in 1979.

Hugh M. Fraser

Hugh Fraser was born in Saskatchewan in 1926 and received his bachelor of science in engineering physics from the Unversity of Saskatchewan in 1948. He received his master of arts in meteorology one year later from the University of Toronto.

Hugh began with the Atmospheric Environment Service (then the Canadian Meteorological Service of the Deparment of Transport) as a meteorologist in 1945. From 1949-1971 he was a forecaster and later a supervisor at the Winnipeg Weather Office, where he received extensive experience in forecasting for the Prairie Provinces, Northwestern Ontario and the Northwest Territories.

From 1971 to the present, he has been with the Scientific Service Division in the Atmospheric Environment Service Regional Headquarters in Winnipeg and, since 1975, Chief of the Division.

He is responsible for programs involving the application of meteorology to forestry, water management, environmental assessment and especially to agriculture. He has also written scientific studies and reports on such diverse subjects as frost prediction, icing on transmission wires, weather related to mosquito outbreaks and weather related to peat fires and drought.

Hugh is a meber of the Canadian Meteorological and Oceanographic Society, The American Meteorological Society and the Biomass Energy Institute.

Married and father of six children, his hobbies include music, cross-country skiing and sailing.

Ron Britton

Ron Britton was born in Regina, Saskatchewan in 1940 and was raised in Lang, Saskatchewan.

He received his bachelor's degree from the University of Saskatchewan and his master's degree from the University of Manitoba. He received his doctorate from Texas A & M University in 1973.

Although he is presently spending his time "shuffling papers in my capacity as acting department head", Ron says he is doing some research on a heat recovery system and a ventilation air tempering system using soil heat.

"My teaching responsibilities relate to classes on both the physical and environmental aspects of farm buildings for agriculture diploma students," he explains.

After receiving his doctorate in 1973, Ron accepted a position as assistant professor with the Department of Agricultural Engineering, University of Manitoba. In 1974 he becane assistant director and assistant professor with the school of agriculture, and in the following years served as adjunct professor and associate professor. He became acting department head of agricultural engineering in 1980.

Ron has been an activist in professional societies relating to agricultural engineering. His list of national and international professional activities is extensive. The committees that relate most closely to the North Feeding the North seminar include environment of plant structures committee which he has been a member of since 1973, and the standards committee, structures and environment division, which he joined in 1979.

Ron has also been extremely active in university activities, agricultural associations and public and community services. He has also published a number of scientific articles on growing plants under protection in Northern Canada, experience in teaching new bioengineering courses, and development of emergency structures for grain storage.

Other articles include observations on greenhouse construction in Texas, greenhouse management, and farm buildings and services.

Ron currently resides in Winnipeg with his wife and two children.

Daryl Kraft

Dr. Kraft was born in Alberta in 1945 and was raised on a ranch in Alberta. In 1968, he received his B.S.A. (honors) degree from the University of Manitoba; he received his Ph.D. degree in 1975 from Washington State, majoring in Agricultural Economics.

He joined the staff of the Department of Agricultural Economics at the University of Manitoba in July, 1973, and is an Associate Professor.

Dr. Kraft's major research interests include land economics, investment technological changes in agriculture, and energy. His public service work includes research conducted for Agriculture Canada and for the Province of Manitoba. He has been very generous in giving of his time for Extension Seminars and meetings.

Wayne Fraser

Wayne Fraser, presently Director of Safety and Environment with Hudson Bay Mining and Smelting Co., Ltd. in Flin Flon, has had some 12 years professional experience in matters related to the environment, and has been a Flin Flon resident all of his life except for attending the University of Saskatchewan to obtain a B.Sc. in Chemical Engineering.

Wayne has been actively involved in a number of horticultural areas, including reclamation of mining lands and waste dumps, and has authored several papers on the subject.

He was a task leader, contributor and reviewer to a Federal CANMET guideline document on reclamation by vegetation.

Through his capacity at HBM&S, Wayne has actively promoted private horticulture in the Flin Flon area, and has been personally involved in gardening most of his life.

Robert Harris

Robert Ernest Harris is a research scientist with Agriculture Canada. Harris is noted especially for two major phases of his work - plant breeding and agrometeorology.

In agrometeorology he has provided leadership in the sorting, analyzing, and interpretation of long-term meteorological data which characterizes a major geographical area in northwestern Canada. His theories and concepts on crop-climate interactions have a major bearing on the direction of the agricultural research thrust in northwestern Canada.

Harris' educational qualifications consist of a BSA in Genetics and Horticulture, a Masters in plant nutrition - Horticulture, and a Ph.D. in taxonomy, cytology and ecology.

Much of Harris' work has developed into a number of breeding strains of plants that are now common in western Canada.

Of interest to the northern agriculturist is Harris' tomato lines for both low and high temperature fruit set and uniform ripening for mechanical harvesting.

He is a member of the Canada Committee on Agrometeorology, the Co-ordinating Committee on Water Quality for the Yukon and the Northwest Territories, the International Society of Horticultural Science, the Canadian Botanical Association, the International Plant Propagators Society, the Society of Plant Tissue Culture and the Alberta Horticultural Advisory Committee. He was also on the Committee on Renewable Resource Research in Northern Canada.

Worth Hayden

Worth Hayden is originally from Wyoming, but moved in 1968 to Edmonton, Alberta, where he completed his graduate education in biology. Early in 1971 he took a position with the Manitoba Government, first as a trout farming extension biologist and later as a fisheries management biologist.

In 1975 he left government service to work as a resource consultant assessing environmental impact of proposed activities and developments in northern Canada.

Worth returned to government service in November, 1980 as Director of the Fisheries Branch in the Department of Natural Resources. In this capacity he is reponsible for affecting rational management of Manitoba's fisheries so they will provide the greatest, long-term benefits to the citizens of the province.

John Bodnar

John P. Bodnar was born in The Local Government District of Stuartburn, Manitoba. He went through the public school system, and studied business courses. He was engaged in the fishing industry as soon as he became of age, having made his home in Winnipeg.

His first fishery alliance was with Red River commercial fishing operations with gradual expansions up to Lake Winnipegosis.

In the year 1939, consumer demands for fish and fishery products exceeded productions. He established permanent residency in the town of The Pas and became involved in developing new areas of fish production.

John interested himself in the founding of Russell Flying Services, Moose Lake Trading Company, Fair View Service, The Pas Agency, Northern Transport, Prairie Queen Drive-in, Manager, Keystone Co-operative and Fresh Water Fish Marketing Corporation, Agent for S. Pennok, New York, Boreal laboratories of Ontario for biological specimins.

John has served as past executive member of The Pas Chamber of Commerce, Charter Member Lions Club, Member Rotary Club, Chairman Northern Manitoba Fishing Association.

He is currently Reeve of The Local Government District of Cosol; President, The Pas and District Agricultural Society; Director, Hudson Bay Route Association; Member of the Canadian Executive Council of Canada; Member of Co-operative Loan and Loan Guarantee Board, Province of Manitoba; and presently resides, along with wife Lucinda, in the Carrot River Valley, west of The Pas.

Stu Law

S.K. (Stu) Law is the associate director with the industry services Department of Fisheries and Oceans, Western Region, in Winnipeg, Manitoba.

He was born in Aylesbury, Saskatchewan and received his bachelor's degree in science from the University of Saskatchewan in 1954. Following graduation, he accepted a position as laboratory supervisor with Dominion Dairies in Toronto and Napanee, Ontario.

Between 1957 and 1972, he worked for Campbell Soup Co. Ltd. in various capacities. When he resigned in 1962, he was manager of quality control for the frozen food and integrated poultry operation.

In 1972 he accepted the position as chief of inspection branch, Fisheries and Marine Services, Central Region, in Winnipeg, and was appointed to his present position in 1975.

His professional memberships include Manitoba Section of Canadian Institute of Food Science and Tehcnology, Association of Food and Drug Officials, Pacific Fisheries Technologists, Chairperson of Qualifications Committee with the Canadian Institute of Food Science and Technology and Vice Chairman of the 1981 national conference of the Canadian Institute of Food Science and Technology.

Stu is also a member of the board of directors for Guardian Chemicals, Fort Saskatchewan, Alberta.

Burton Ayles

Burton Ayles is leader of the Aquiculture Project with the Freshwater Fish Institute in Winnipeg. He presented the "hatching and farming" portion of Friday's panel on fish production.

Burton has his bachelor's degree and master's degree from the University of British Columbia, Department of Zoology. He received his Ph.D. in 1972 from the Department of Fisheries of Canada in British Columbia and assisted in field studies on all aspects of salmonid life history. Between 1967 and 1972, he was a genetics teaching assistant at the University of British Columbia and University of Toronto.

In 1972, he joined the Freshwater Institute as a research scientist (fish genetics) and accepted his present position in 1975.

Burton is a member of the Genetics Society of America, Canadian Genetics Society, Canadian Society of Zoologists and American Genetics Association.

Besides research, teaching and management experience, he was the Canadian delegate to China to review Chinese aquiculture development as part of a Canadian-China fisheries exchange program in 1976. He has also been a fish genetics advisor in Thailand, aquiculture advisor in El Salvador and scientific advisor with the International Foundation for Science in Stockhold, Sweden.

He has published well over 20 publications, abstracts and papers, mainly in the field of fish genetics.

George Vercaigne

George Vercaigne was raised on a farm in Turtle Mountain, south of Deloraine, Manitoba, and educated at Flossie School District 1265 of Deloraine. He farmed with his father until his marriage to Louise Lesy of Deloraine, then moved to Elgin, Manitoba where he mixed grain, farmed and raised weanling hogs. They had a family of five.

George moved to Brandon in 1961, starting a hog finishing operation in Shilo, Manitoba, feeding garbage and complete feeds. He increased operation in 1965 to a total of 2,500 head and in 1967 bought out an existing operation south of Brandon, enlarged it by 2,500 head for a total of 5,000 head. He still maintains the operation and has become a partner with his oldest son in Paramount Feeds, a complete livestock and mixing mill and animal health products business.

During this time he has served as director of Provincial Exhibition for six years, vice-president for one year, member of Toastmasters 293 Brandon for four years, chairman of Pork Producers of Manitoba before Manitoba Marketing Board became a producer organization. He is presently Chairman for District (2) Manitoba Hog Marketing Board Delegate structure and represents Manitoba on the Federal Stabilization Advisory Council specializing in hog programmes. He is a member of St. Augustines Catholic Church in Brandon, serving on parish council for three years and chairman for one year. Recreational favourites are skiing, golfing, travelling and tripping the light fanstastic.

Joe Tsukomoto

Joe Tsukamoto was born in New Westminster, B.C. He attended school in Japan, and returned to Canada for further education. The war intervened, however, and he spent the war years, along with many other Japanese Canadians, working in the sugar beet fields of southern Alberta.

Upon his return to Canada, Joe gained a wide range of agricultural experience when he worked in small fruit farming, market gardening, mixed farming with irrigation, sugar beet production, and ranching.

He studied at Olds School of Agriculture and McGill University, where he also did graduate work in plant breeding forage crops. As a student Joe worked with Agriculture Canada at research stations in Lacombe, Fort Simpson, N.W.T., and Whitehorse, Y.T.

He became a research officer and then director of the Research Station at Mile 1019, Alaska Highway, Y.T. (formerly known as Whitehorse Experimental Farm). When policies regarding northern agricultural development became less progressive, Joe resigned from the federal Department of Agriculture and moved to Manitoba in 1967.

He is employed by Manitoba Department of Agriculture in the Soils and Crops Branch. Until 1972, he specialized in forage crops. Since then he has been engaged in new crops investigation which currently includes work as project leader for the soybean under the Agro-Man Program.

Joe's interest in special crops has taken him on trips abroad to observe foreign crop production. His experience and knowledge, including a facility in the Japanese language, have led to participation in various government trade missions overseas and to speaking engagements in Japan.

Joe is an active member of the Agricultural Institute of Canada and the Manitoba Institute of Agrologists.

R.J. Richmond

R.J. (Bob) Richmnd is an agrologist with the British Columbia Department of Agriculture in Kamloops, B.C.

He was born and raised in Alberta and received his Bachelor of Science from the University of California. His post graduate degrees include Master of Science and Doctorate of Science from the University of Alberta in Edmonton. His post-graduate research covered a number of topics, but centered particularly on genetics research.

Between 1968 and 1978, Bob's activities were divided between lecturing, research, consulting, and his private family cattle, bison and yak production.

Between 1971 and 1978, he was involved in conducting a feasibility study related to the use of indigenous species.

Since 1978, Bob has been working with the B.C. Ministry of Agriculture as a beef cattle specialist. He is also continuing his involvement in the use of natural resources.

Blake Donohoe

Blake Donohoe is a well known dairy farmer and breeder of purebred Holstein cattle.

In 1975, he and his family formed Donfield Farms Ltd., of which he is president.

In 1977, the company purchased a dairy farm at The Pas. The company now operates two dairy farms, one at Brandon and one at The Pas.

Blake represented the milk producers of Brandon from 1974 to 1977 on the Manitoba Milk Producers' Marketing Board. He resigned in 1977 to give more time to Donfield Farms operations.

He has served as president of Holstein-Friesian Association of Manitoba, director of Manitoba Milk Producers Cooperative and president of Manco Milk Plant in Brandon.

Always active in community affairs, Blake was a 4-H club leader for 14 years.

Karen Wittenburg

Karen Wittenburg is a dairy specialist who grew up in the Woodlands-Warren area on a dairy farm.

She received her bachelor's degree in agriculture in 1975 and her master's degree in animal nutrition in 1977 at the University of Manitoba.

After spending two years working with the department of animal science at the University of Manitoba as a research associate, she started with Manitoba Agriculture (October 1979) as a dairy cattle specialist.

Karen says her main efforts have been in the areas of nutrition and management of dairy cattle. She has also, however, spent time workng with the Manitoa Goat Association which got off the ground last fall.

Karen recently attended the symposium on Northern Animal Agriculture and a plenary session on northern agriculture at the Agricultural Institute of Canada Conference recently held in Edmonton.

Bob McGinnis

Robert C. (Bob) McGinnis is dean of the faculty of agriculture with the

University of Manitoba and will provide the summation at the end of the North Feeding the North Seminar.

He was raised on a farm near Edmonton, Alberta, and received his bachelor's degree and master's degree in Agriculture from the University of Alberta. In 1954, he received his doctorate in agriculture from the University of Manitoba.

His career started in 1951 when he accepted a position as cytogeneticist with the Agriculture Canada Research Station in Winnipeg.

Between 1960 and 1965, he was an associate professor in the plant science department, faculty of agriculture, at the University of Manitoba.

In 1965, he became head of the plant science department and the University of Manitoba and remained there for 10 years.

Between 1973 and 1975, he took leave from the university to serve as director at the National Plant Breeding Station in Njoro, Kenya, which conducts the major wheat breeding program for East Africa.

From Africa he went to Hyderabad, India, where he was deputy director of the International Crops Research Institute for the Semi-Arid Tropics. Here he was responsible for initiating programs of technical assistance in several countries around the world, but particularly in Sahelian Africa. The programs concentrated on improving national capability to increase food production and training was an important component.

In 1979, he accepted his present position as dean of the faculty of agriculture with the University of Manitoba.

He is a member of several professional organizations, including Genetics Society of Canada, New York Academy of Science, etc. He is also a member of several local, national and international committees and missions.

Bob is married, has three children, and is a member of the Fort Garry Rotary Club and United Church.

SPEECHES

Mrs. Isabell Turk

YOUR HONOUR, LADIES AND GENTLEMEN:

As President of Norman Regional Development Corporation, I would like to direct my opening remarks to those in the audience who are not from The Province of Manitoba and to those of you who are not aware of the Regional Development Corporation concept.

Norman Regional Development Corporation is a non-political organization, funded by The Manitoba Provincial Government, eleven member municipalities, together with the major mining companies in the region as associate members. The Board of the Corporation is made up of elected and appointed members of the councils of all the incorporated communities in Manitoba, north of the 53rd parallel. These include the cities of Thompson and Flin Flon, the Towns of The Pas, Snow Lake and Leaf Rapids, and the Local Government Districts of Grand Rapids, Consol, Churchill, Lynn Lake, Gillam, and Mystery Lake. The by-laws of the corporation also provide for Ex-Officio members appointed by the Ministers of the Manitoba cabinet holding portfolios in the Departments of Economic Development and Tourism, Agriculture, Mines and Resources, Northern Affairs, Education, and Health and Social Development.
Voting directors are established on The Board from the Manitoba Indian Brotherhood, The Manitoba Metis Federation, and The Manitoba Federation of Labour.

The Corporation came into being ten years ago and has been concerned with any subject, either of a social or economic nature, that affects the quality of life in a region that encompasses 140,000 square miles with a population of approximately 75,000 people (almost one per two square miles).

For your further information there are 5 other R.D.C.'s in full operation in the Province.

At one of our Directors meetings in early 1976 - over 4 years ago - the need to examine the question of increased food production in the north primarily to economize on transportation costs was discussed. This emerged from one of the

Board's extensive examinations of the worsening energy situation. It took more than 3 years to get all the desired pieces together at the same time. And yet as the months went by the need became greater. And so here we are. After Dr. McGinnis has concluded the Summation tomorrow afternoon. Many of you will be interested to learn that delegates have arrived from as far east as Halifax, Nova Scotia and as far west as Prince George, B.C. As President of Norman R.D.C. I am delighted to learn of the extensive attention being paid to this event by all segments of the media. We greatly value the exposure you are giving to this subject.

It is now my pleasure and privilege to introduce our Lieutenant Governor, who a few years ago was a fellow colleague as a member of The Board of Directors of Norman R.D.C., and who at the corporations founding a decade ago, was it's first President. Ladies and Gentlemen would you please join me in welcoming His Honour, Lt. Gov. F.L. and to us all, Bud Jobin.

SPEECHES

1. OFFICIAL OPENING

Hon. F.L. Jobin
Lieutenant-Governor
Province of Manitoba

Ladies and Gentlemen, It is indeed a pleasure for me to officiate at the opening of this "North Feeding the North" seminar. Many of you do not need to be reminded that I am a citizen of the north, having lived and worked in Flin Flon from the mid '30s until I was appointed to my present position almost five years ago. Like most of you, I am fully aware of the trials and problems of raising a family in these latitudes, as well as the joys of hunting and fishing and the wide open spaces the region provides. I have no doubt that the advantages grossly outweigh the disadvantages.

It has always been an enigma to me that the major mining companies, namely Hudson Bay Mining and Smelting, Inco, and Sherritt Gordon, and I suppose this also applies to Manfor, experience difficulty in attracting both skilled and unskilled labour to this wholesome region when the rest of our nation admits to an unemployment figure of 7 percent. When one considers the benefits available in Northern Manitoba and the opportunities that prevail, it is difficult to accept that elsewhere we are paying Canadians not to work. As I have pointed out I am a true Northerner and, as Mrs. Turk has told you, I was the first president of Norman Regional development Corporation when it was formed a decade ago. I have maintained a keen interest in all the corporation's activities ever since, includng the years of my vice-regal office I am proud of Manitoba and thank all who over the years have worked to fulfill our dreams. I am reminded that at a previous large seminar hosted by the corporation, entitled "Distribution North" held in Flin Flon 5 years ago, I was at that time the Mayor of Flin Flon and officiated at the opening ceremonies. That seminar was a great success and the transcripts of its proceedings is still being used as a reference text.

The first seminar was held in February 1975 The "Housing Workshop and Group Seminar" in which Lloyd Axworthy participated. I am therefore gratified to see that the "North Feeding the North", because of your attendance, has all the makings of a greater success. It is well to note that the two previous seminars and this were and are the responsibility of Denis Hindson, General Manager of Norman.

Over 200 years ago, in its development of the northern fur trade, the Hudson Bay Company realized that they could sustain their work with corn and other vegetables grown right here in the Pasquia area. This was long before the first log was attached to its neighbour at Fort Garry. So way back in our past The Pas was a springboard for regional development and here we are to-day, again utilizing the community for development with the advent of the deliberations you are about to hear.

As people with an interest in the Agricultural Field, you are all aware of the escalating costs of food and food production. Such increases are mostly attributable to the cost of transportation such that the Corporation's Board of Directors foresee the conditions arising when it will be cheaper to grow most of our food than to pay for fuel to transport it from outside. This trend may cause Canadians, as a whole, and The North in particular, to return to the same kind of regionalism we knew 70 years ago.

A fair analogy to the way conditions are developing is the Alberta Tar Sands. 10 or 12 years ago, Sunoco, under the name of Great Canadian Oil Sands, were the only oil company operating near Fort McMurray. They were then extracting oil from the Sands at about $11.50 a barrel: At the same time the surrounding Alberta oil fields were producing at a well-head price of less than $2.00 a barrel. (Yes! It's hard to realize that that was only 10 years ago.) Such is inflation! We are now looking at over $30.00 a barrel, thanks to OPEC and world inflation. This cost escalation has made the Tar Sands viable.

The same principle can be applied to vegetables and other food. A head of lettuce which is now taken off the ground in California for 5 cents can show up, in winter months, on a grocer's shelf in Lynn Lake or Churchill for $1.65.

So, when the largest segment of the retail price is devoted to transportation we must seriously look at the possibility of producing whatever food we can right in our own region and at the same time save the depleting fossil fuel for other purposes.

I am indeed happy to find all aspects of Northern Life co-operating together in this endeavour. Norman R.D.C. has unquestionably been an effective catalyst in getting so many diverse interests focused on one basic need. Here we have, in this hall, representatives of many government departments (Both Federally and Provincially) as well as the Municipalities, The Manitoba Indian Brotherhood, The Manitoba Metis Federation, The Mining Companies, The Unions, The Universities and Colleges, The Chamber of Commerce, plus the Farmers and Ranchers, plus a large contingent made up of all segments of the media.

The Ad Hoc Committee, formulated last January, are to be congratulated on the recruitment of such high-caliber panelists. I know you are going to benefit from their presentations.

The local organizing committee are also to be commended on the excellent arrangements that have been made.

As the Queen's representative I am delighted to welcome each and every one of you, and thank you for coming.

In conclusion, let me emphasize one vital development stepping stone that this seminar is designed to create - jobs! One thing that will emerge from the 17 papers to be presented is an opportunity for work. It is the organizers' hope that entrepreneurs, and those of vision, will come forward in the coming months to turn these opportunities into reality.

It is further hoped that most of the employment openings will be grasped by the native people of the region.

And now a challenge to Norman the originators.

Good Luck to you all

SPEECHES

2. WELCOME TO THE PAS

Mayor Doug McBride

Regrettably not recorded.

3. SPEECHES - "LAND, WATER, WEATHER"

MODERATOR, Dale Stewart, Deputy Minister, Northern Affairs

Good morning ladies and gentlemen, It is my pleasure to introduce Bob Smith, of the Land Resources Research Institute. He is the head of the Winnipeg survey unit, and has directed the soil survey project in Manitoba for the past twelve years. That is, the federal-provincial soil survey project. He has been associated with the department of soil science of the University of Manitoba, closely associated with the graduate program. He has done an evaluation of land and soil for many different uses in Manitoba: agriculture, forestry, and wildlife.

LAND

Bob Smith: Head of Canada-Manitoba soil survey:

In answer to the burning question: Is there land north of the 53rd parallel suitable for food production? The answer is yes.

The purpose of this paper is to provide an overview of additional farmland available for crop production in Manitoba; describe briefly some of their characteristics and limitations inhibiting their use for agriculture development in northern Manitoba.

While the aim of this symposium is to evaluate basic resources available for production of food in northern Manitoba, the focus of this paper will deal with all land reserves that lie beyond the presently developed agricularal area of the province. The principal reason for this is that a relatively large area of undeveloped agricultural land occurs in southern Manitoba that will have a very significant effect on future agricultural development in the north.

Agriculture Capability of Soils

The agricultural capability of soils in southern Manitoba has been classified in the Canada Land Inventory (CLI), a system that has relied heavily upon soil survey information collected over 45 years to develop interpretations of land for various uses. By employing regional guidelines, mineral soils have been grouped into seven classes according to their suitability and limitations for agriculture. Soils in classes 1 to 3 are considered capable of sustained production of common cultivated crops: wheat, oats, barley, flax, that you're familiar with. Those in the fourth class are marginally arable. The fifth class is capable of use for improved pasture and hay, the sixth for native pasture, and the seventh is for soils and land types considered unsuitable for any agricultural use. In this exercise, in the 60's and 70's, organic soils were not evaluated in this system because of the lack of definitive information for assessment. This does not mean that organic soils do not have agricultural potential.

Extent of Agricultural Land Resources in Southern Manitoba

To date, the area within the CLI boundary takes in approximately 35 percent of the land area in the province and excludes most of the area north of the 53rd parallel except for the Pasquia and Cross Lake areas.

It includes all of the prime agricultural land (5.4 million hectares of CLI classes 1 to 3) and 2.6 million hectares of marginally arable (Class 4) land. In addition, there are about 4.4 million hectares with potential for pasture (Classes 5 and 6) and 3.6 million hectares of organic soils with some potential for varying agricultural uses (2).

It is apparent that although Manitoba has a substantial land area (54.8 million hectares) only 10 percent is suitable for crop production. Most of the province because of a combination of climate, soils, and terrain characteristics - bedrock precambrian, familiar to most of us, is unsuitable for agriculture.

Most of the unfarmed land reserve in southern Manitoba with varying capability for agriculture occurs in the wooded areas extending from the Tolstoi and Piney districts in the southeast through the Interlake-Westlake areas south of Grand Rapids to the Manitoba Escarpment in the Red Deer Lake area.

Major limitation of the soils in these areas are the result of stoniness, very complex landforms and poor drainage. Landforms are characterized by a very repetitive ridge and swale pattern. The stony ridges are separated by elongated areas of poorly drained mineral and organic soils. Modification of the ground moraine by wave action of former glacial Lake Agassiz produced an erosion surface over much of the landscape. The associated continuous layer of cobbles and stones at or near the surface constitutes a severe limitation to cultivation.

However, on the positive side, this is the only land reserve in Manitoba that has no significant regional agroclimatic limitation. If limitations due to stoniness and poor drainage can be ameliorated economically, these areas possess good potential for agricultural expansion.

Approximately 35 percent of Manitoba's land surface consists of organic soil. These 19.3 million hectares are for the most part, concentrated in the low lying, poorly drained regions in the cool, subhumid Boreal Forest Region in southeastern and central Manitoba and in the cold Subarctic Hudson's Bay Lowland. About 3.6 million hectares, with varying capability for agriculture, occur in the more favorable climatic regions of central and southeastern Manitoba. It is estimated that .6 million hectares are potentially arable and an additional 3.0 million hectares have potential for use as forage and pasture land (14)

The role that organic soils will have in future agricultural development is difficult to assess. However, what is certain is that large public investment for improved drainage and specialized skills by farm operators make these soils much less attractive for development than mineral soils.

Extent of Agricultural Land Reserves in Northern Manitoba

Definitive data for the evaluation of land for Agriculture for areas that lie north of the 53rd parallel and the inaccessible areas east of Lake Winnipeg is limited. However, several areas of importance to Agriculture do exist. The major area is the so-called Northern Clay Belt that extends from Cross Lake and Wabowden northward through Thompson and Nelson House to Southern Indian Lake. Approximately 1.1 million hectares of marginally arable (CLI Class 4) and land with varying potential for forage and pasture (Classes 5 and 6) occur in this area. A second much less extensive area, .2 million hectares, occurs in The Pas-Wanless area.

Beyond these two areas, agricultural land reserves become increasingly more scarce because of the restrictive effects of unfavorable climate, bedrock outcroppings, excessive stoniness, permafrost, and poor drainage. However, clayey soils useful for small community garden plots to produce vegetables or limited subsistence mixed farming can be found along the Churchill River from Pukatawagan to Southern Indian Lake (about .5 million hectares); Norway House; Oxford Lake; God's Lake; Island Lake (.1 million hectares); and the numerous rivers and streams that drain into the east side of Lake Winnipeg from Bird River north to Belanger River (.5 million hectares).

Estimates of potential agricultural land in areas bordering on the clay belt and those that lie to the east of Lake Winnipeg can only be considered as very proximate since soil survey data for these areas to date is very limited. In assessing the potential agricultural value of these peripheral areas consideration must be given to the fact that useful soils are usually poorly located, often distributed in small pockets or dissected by poor soils by steeply sloping bedrock outcroppings. Such situations render development of agricultural soils extremely costly if not impossible.

The northern clay belt is limited by a cool to cold subhumid, continental climate. Average frost-free period of usually less than 100 days limiting the production of crops having high heat unit or long growing season requirements, especially wheat, grain corn, fababeans, field peas, and sunflowers. Growing season precipitation is usually sufficient for adequate yields of coarse grains, oil seeds and forages. In the absence of other limitations the soils of the area, at best, can only rate as Class 3 because of climate. However, other factors tend to overshadow climatic limitations.

Undulating lacustrine clay deposits are predominant in the clay belt, although sandy outwash and ice contact deposits are also significant. Shallow, frozen organic veneers and thick organic deposits with widespread discontinuous permafrost pockets cover much of the clay deposits. Excessively stony, shallow, sandy morainic veneers interspersed with undulating Precambrian rock outcroppings occur on the periphery, particularly along the northeastern and northwestern fringes.

The main limitations of the well to imperfectly drained, clayey, Gray Luvisol soils are massive oil structure, severe surface crusting when cultivated, excesss soil moisture and low nitrogen supplying power. For these reasons, these soils are rated as marginally arable CLI Class 4). The main limitations of the sandy, ice-contract and outwash soils are dryness and low inherent fertility. These soils are dominantly Class 5. The shallow, sandy morainic soils are not only limited by excessive stoniness, dryness and inherent low fertility, but also by steep slopes and associated bedrock outcroppings which generally render these soils unsuitable for virtually all agricultural use, save poor native pasture (predominantly Classes 6 and 7). Shallow and thick organic soils with widespread patches of permafrost which occupy more than 50 percent of the clay basin for the most part, not suitable for agricultural uses.

The Regosolic clayey alluvial soils of the Saskatchewan River Delta are limited mainly by excessive wetness and poor soil structure. The degree of severity of these limitations ranges from arable soils with a moderate wetness problem (Class 2 and 3) to land suitable only for forage and pasture because of excessive wetness (Class 5 and 6). The better soils occur along levees of streams and tributaries of the Pasquia, Carrot and Saskatchewan Rivers. The lower quality soils, by far the greatest percentage, occupy poorly to very poorly drained depressional areas that lie between the levees.

Development of the better soils suffer because of their poor distribution in relatively small ribbon-like patterns. A large part of this area which extends into Saskatchewan would absorb high capital inputs to install and maintain adequate drainage.

Soils of the Wanless area consist of marginally arable (Class 4 and 5), well to imperfectly drained Gray Luvisolic soils developed on lacustrine clay. These soils are intermixed with grazing and forage lands (Class 6) that are very stony, sandy to loamy morainic materials. Again, the poor quality soils are predominant in this area.

The foregoing discussion on the supply of land for agriculture and their constraints for the growing of annual crops and forage suggests that: (a) Manitoba's supply of good arable land (Classes 1, 2 and 3) is very limited and that virtually all of it has been improved for crops and tame hay production; and (b) that a substantial potential area of marginally arable land and pasturage exists in northern Manitoba as well as in the climatically more favorable southern regions of the province.

Recent Trends in Use of Farmland and Crownland

In projecting the possible utilization of potential land resources for agriculture in northern Manitoba, some assessment must be given to present trends in the use of land held as farms and those that are leased or rented from the Crown (1, 10).

Since 1941, total land held as farms has only modestly increased by about 13 percent or approximately .9 million hectares to 7.7 million hectares. Greatest gains have occurred in the immediate post war period 1945 to 1951 and during the 1961 to 1966 period reflecting improved markets and prices for cereal grains and oilseeds. However, gain in total farmland since the mid 1960's has been negligible.

Improved land and correspondingly, land seeded to annual crops have increased by a substantial 1.2 million hectares or 30 percent since 1941. The more significant adjustments again taking place between 1945 and 1951 and the 1960's.

The ratio of fallow land to seeded land has been decreasing steadily since 1941 from about 30 percent to about 20 percent at the present time.

In the 1970's reduction of fallow has been the only significant method of increasing seeded hectarage in the province since new land acquisitions and conversion of unimproved land on farms has been negligible from 1971.

The 2.5 million hectares or 32 percent of unimproved land on farms are comprised of approximately equal proportions of Class 4, 5 and 6 land. It is apparent that since 1971 poor markets and high costs of production have not favored the improvement of marginally arable land (Class 4) or land with hay and grazing potential (Classes 5 and 6).

Land use on farms in the Interlake, the Westlake, and Southeastern districts that border on the areas of agricultural development reflect not only the current unattractive economic environment for expansion of the cropland base but also the continuing higher costs of crop and livestock production due to inherent, more severe limitations of the soils in these areas. Unimproved land ranges from 49 to 63 percent in these areas as opposed to approximately 32 percent in the developed sector. Incentives to farmers and ranchers to encourage improvement of Class 4 and 5 lands, the dominant classes in these regions, is currently being offered by the provincial government through its Treed Rangeland Improvement Program. This program offers assistance in interest payments, up to a maximum of $2,000 on loans taken out by farmers and ranchers to clear and seed land to tame hay.

Statistics available on use of agricultural crown land in the organized sections of the Interlake and Westlake regions also indicate only slight expansion in land base for crops and tame hay production since 1973. Improved hay and pasture increased from 10,000 to 28,754 hectares, about 4 percent of total leased crown land, whereas improved land for crops has remained virtually constant, approximately 10,000 to 13,000 hectares or about 2 percent of the 750,000 hectares of agricultural crown land under lease. Much of the stimulus for improvement of the predominant Class 4 and 5 land in these areas is provided by subsidies available through the Crown Land Improvement Program adopted in 1973 (1).

The current objective of this program is to encourage farmers and ranchers who have leased Crown lands to develop land suitable for improvement (dominantly Class 4 and 5). Current annual budget available for this program permits improvement of about 3 or 4 thousand hectares annually.

Yield and Potential Production of Major Crops

Assessment of potential yield and production of major crops that can be grown on available land reserves and. in particular, those that occur in northern Manitoba is based on limited agronomy and soil fertility studies. Experimental work carried out by the Research Branch of Canada Agriculture at Wabowden from 1955 to 1965 provide good data for the clay belt (4). Data available from the Pasquia land settlement field crop demonstrations coordinated by Prof. J.H. Ellis, University of Manitoba from 1956 to 1970 provide a good guide to the productivity of lands in the Saskatchewan River delta area.

Spring Wheat

Various varieties tested at the Wabowden station, 1955 to 1960, indicate yield and quality are both low, and that it is doubtful that wheat can be grown profitably. However, yields of 7 to 11 bushels per acre and low protein contents of less than 10 percent obtained in these trials with addition of 10 lbs. of nitrogen and 12 lbs. of P_2O_5 suggest that tests were conducted under less than ideal fertility conditions.

Available data from the Pasquia project indicate that yields of spring wheat are comparable to those in southern Manitoba (6). Available agricultural statistics indicate a current provincial average of about 30 bushels per acre or 2,000 kilograms per hectare. Given current average climatic conditions in the province and optimum management, approximately 52 bushels per acre or 3,500 kilograms/hectare can be achieved (15).

Oats

Current varieties of oats, like wheat, are not well adapted to clay belt conditions. Like wheat, oats were damaged by frost 2 out of 6 years of testing (4). Yields of oats at Wabowden for the testing period 1955 to 1960 ranged from 24 to 28 bushels per acre with additions of 10 lbs. of nitrogen and 12 lbs. of P_2O_5. These data also suggest inadequate soil fertility during the test period.

Data for the Pasquia area suggest that yields of oats are comparable to those in southern Manitoba, approximately 50 bushels per acre or about 1,900 kilograms per hectare. Climatic potential of oats, given optimum management inputs including 80 to 100 lbs./acre of nitrogen and about 35 to 40 lbs. of P_2O_5, is 90 to 100, bushels/acre or approximately 3,500 to 3,800 kilograms per hectare (15).

Barley

Barley is well suited to the clay belt and Pasquia region. At Wabowden, frost did not injure this crop during the test period 1955 to 1960 (4). Yields were very comparable, at least experimentally, with those of southern Manitoba. Current average farm yields of barley in southern Manitoba range from about 40 to slightly less than 50 bushels per acre or from 2,100 kilograms to 2,600 kilograms per hectare (15). Optimum expected yields of barley in southern Manitoba is about 87 bushels per acre or approximately 4,700 kilograms per hectare. It is not unrealistic to expect about 90 percent of those yields in the clay belt provided that adequate fertilizer and other management inputs are optimum as well.

Flax

Flax, like wheat, requires a long frost-free growing season. Frost prevented flaxseed from ripening in three of five years of testing at Wabowden. It is probable that flax is not adapted to clay belt climatic conditions.

Data available for the Pasquia area indicate that average flax yields are comparable to those in southern Manitoba. Current average provincial yields are about 16 bushels per acre or about 1,040 kilograms per hectare. Flax will respond to nitrogen fertilizers on nitrogen deficient soils. Optimum yields of flax in Manitoba, when adequately fertilized and managed, is approximately 28 bushels per acre or 1,771 kilograms per hectare.

Rapeseed

The Polish type varieties of rapeseed such as Candle are most suitable for the clay belt. Late maturing Argentine types can be affected by frost. Yields on a 3-year trial from 1957 to 1959 at Wabowden ranged from about 450 to 500 lbs. per acre or about half the current provincial average of 1,100 lbs. per acre.

Yield data available for the Pasquia area indicate that they are comparable with those in southern Manitoba.

Rapeseed has a high requirement for nitrogen, phosphorus, potassium and sulphur. It is probable that the trials at Wabowden were conducted at much less than optimum fertility conditions. Data available in southern Manitoba show that linear responses are usually obtained at rates up tp 100 lbs. of applied nitrogen per acre.

To ensure good yields, 40 lbs. of P_2O_5, 35 lbs. of K_2O and 30 lbs. sulphur should be added to well drained Gray Luvisolic soils such as are found in the clay belt and Wanless areas.

Given these levels of fertilizer input yields of 2,000 to 2,200 lbs. per acre, about 2,200 to 2,500 kilograms per hectare, are possible in the Pasquia area. Yields in the clay belt would be somewhat lower.

Potatoes

Trials from 1959 to 1962 at Wabowden indicate that average marketable yields of Norlands and Kennebic ranged from 425 to 371 bushels per acre, respectively. These are remarkably good yields in light of current average farm yields of 250 to 300 bushels per acre in southern Manitoba. Yields at Wabowden were obtained by adding 25 lbs. of nitrogen, 75 lbs. of P_20_5 and 25 lbs. of K_20 fertilizer per acre. Potential yield of potatoes in southern Manitoba is estimated to be 20,000 to 25,000 kilograms per hectare or about 400 bushels/acre.

Legumes and Grasses for Hay

Most varieties of alfalfa, red clover and grasses yielded well under test at Wabowden. Experminental yields of alfalfa ranged from 2.5 to 3.2 tons of dry matter/acre (5.6 to 7.2 metric tonnes/hectare); red clover from 2.5 to 3.5 tons per acre (5.6 to 7.8 tonnes/ha) and various legume-grass mixtures from 2.2 5o 2.7 tons per acre when fertilized with 80 lbs. of nitrogen and 50 lbs. of phosphate fertilizer. Current on-farm yields of legume hay in southern Manitoba range from 2.0 to 2.5 tons per acre, while grass-legume mixtures and grass alone are significantly lower at 1.0 to 1.5 tons per acre; all farm yields being well below the potential of 4 to 6 tons per acre.

Grasses and Legumes for Seed

Excellent yields of seed for various grassses were obtained at Wabowden. Slender wheatgrass which ranged from 385 to 480 lbs. per acre, bromegrass from 277 to 350 lbs., meadow fescue 300 to 434 lbs. are good examples.

Yield of Ladak alfalfa seed ranged from 127 to 185 lbs. per acre and Altaswede red clover from 75 to 94 lbs., which appears to be low in relation to current provincial average yields.

Summary Discussion of Cropping Potential in the North

Available data indicates that economic yields of all regionally adapted crops can be obtained in the Pasquia-Wanless region. These data also suggest that a significant difference in agroclimatic conditions exists between the Pasquia area and the clay belt to the northeast.

Crops such as wheat, oats and flax which require a significantly longer growing season than crops such as barley, did not yield as well under test at Wabowden. However, the low test yields of these crops and, in particular, rapeseed suggest a confounding effect of inadequate plant nutrition. But for barley and the legumes, most experiments at Wabowden employed relatively low rates of nitrogen by today's standards . Rapeseed has a high requirement for nitrogen, phosphorus, potassium and sulphur. Except for adequate potassium the clay soils of the Wabowden area are very low in nitrogen, phosphorus and sulphur supplying power. With adequate fertilization, rapeseed, particularly the short season Polish variety Candle, should do well in the clay belt.

Yield data available from similar climatic regions outside of Manitoba such as the Fort Vermillion area in northern Alberta (latitude 58° 18' N, 116° W, altitude 275 meters a.s. l.) suggest that yields of cereals including wheat, rapeseed and forage are equivalent to those being achieved in southern Manitoba (7, 8). Such data reinforces the fact that cereal and oilseed production in northern regions such as the clay belt in Manitoba, is a very real option.

Average yields actually being obtained on farms in southern Manitoba are well below the regional yield potential for all crops ranging from 30 percent of potential in the case of forages grown for hay to about 50 percent for most cereals and rapeseed to about 85 percent of potential for potatoes. Shortfalls in actual farm yields would probably be similar if not greater in the clay belt.

Potential for Agricultural Development in Northern Manitoba

Manitoba's arable land reserve of 4.7 million hectares, comprised of 2.8 million hectares of mineral soils and 0.6 million hectares of organic soils located in the southern agricultural fringe and 1.3 million hectares in the Pasquia and northern clay belt regions, represents a potential 90 percent increase in land base for crop production. It also represents one of the five important areas in Canada as having untapped potential for arable uses.

However, if one takes the usually unreliable approach to predicting the future by projecting historical trends, the future of agricultural development in northern Manitoba appears to be very limited. It is limited not so much because of the lack of adequate land base or climatic hazards so much as it is for reasons of economics and the reluctance of government to risk such development.

Currently, Canadian agricultural output is capable of satisfying both domestic and available export markets for cereal and oilseed and livestock products on existing land base. In fact, total output of agricultural products in Manitoba has increased substantially despite the fact that conversion of unimproved land to cropland has been negligible since 1971. Current high costs of production in relation to relatively low prices for farm products do not provide an environment for expanding cropland into marginally arable areas such as the Interlake or northern clay belt regions. Necessary higher capital and operating inputs including energy for stone removal, improvement of drainage and higher fertilizer rates indicate substantially higher costs of production in these areas.

It should also be noted that government policy in Manitoba has been to retain forest land and land with apparent low agricultural potential in public ownership, leasing to operators for varying lengths of time, the right to cut and graze native hay as in the Interlake or to cut and remove timber from crown land as in the north. Large tracts of potentially arable land have been leased on a long term basis to the pulp and paper interests both in the clay belt and in the agricultural fringe in the south. In effect, restricting agricultural development to those areas where agriculture already has a fairly strong foothold.

The possibility of a future for full-time farming, if there is to be one in the northern clay belt, will probably take one or a combination of three forms: a) cereal and oilseed production, b) cow-calf operations, and/or c) limited specialized production of potato, grass and alfalfa seed production.

Available cereal and oilseed production data from Wabowden (4) and in the climatically similar Peace River region in northern Alberta (7, 8) make the possibility of producing barley and Polish type rapeseed potentially viable. There are a large number of barley varieties which apparently can be grown successfully at 36 to 40 bus. per acre in the Peace River region. Farm yields of dominantly Torch and Candle Polish type rapeseed in the Peace River Region is approximately 1,000 lbs. per acre, somewhat lower than southern Manitoba production. Improved markets and higher prices are required before this becomes a viable option in northern Manitoba.

The second agricultural possibility is a cow-calf operations since this type of enterprise can probably be established more cheaply in the north than in the south because of the cost of land and the possibility of producing all the hay and pasture locally is extremely good. Southern Ontario farmers currently are establishing cow-calf operations on the relatively cheap land available in the Cochrane clay belt of northern Ontario, an area similar in physical and economic characteristics to Manitoba's clay belt, in order to raise an assured supply of cattle at cost of production. The feeders are shipped south to home farms for finishing on corn grown on land far too expensive to raise cattle.

A third possibility is the growing of specialty crops for seed such as potatoes, legumes and grasses. Yield data from Wabowden suggest that such crops can be grown successfully. Because of the vigorous northern climate and relative isolation of the north they can also be grown disease-free. The higher prices for seed crops could make them competitive despite freight rate disadvantages in the north.

While it has been demonstrated that excellent crops of root, vegetables and cole crops can be grown successfully for the local fresh market in the north, it is questionable whether such crops can compete on a year round basis with more cheaply produced, assured supplies of such crops in the south. The very limited market for these crops in the north also make them negligible in terms of future agricultural production or utilizing the available potential land base in the north. It is estimated that approximately 500 acres of crop is all that is required to satisfy 100 percent of the market in the north (12) or sufficient scope for 2 or 3 commercial growers.

Part-time farming is bound to emerge as a distinctive part of northern agriculture as long as there are extractive industries such as forestry and mining in the region. But like vegetable crop growing, part-time farming is negligible in terms of future agriculture production or the land base required for such use.

Summary

The extent of Manitoba's agriculture land base for crop production is currently limited to approximately 5.2 million hectares or 10 percent of its total land area of 54.8 million hectares.

Virtually all of Manitoba's 4.7 million hectares of agricultural land reserve suitable for arable uses is only marginally suitable for such uses (dominantly CLI land class 4). About 1.3 million hectares or approximately 28 percent of this reserve occurs in the Pasquia-Saskatchewan River Delta and "northern clay belt" regions in north central Manitoba. An additional .8 million hectares of land with varying capability for agricultural uses are found adjacent to the clay belt and along the east side of Lake Winnipeg. However, soils in these areas are poorly located and often distributed in small pockets or dissected by rock outcroppings or poor soils.

An additional 3.7 million hectares of mineral soils and 3.0 million hectares of organic soils in Manitoba have some potential for use as forage and pasture.

High costs of production relative to low commodity prices and current provincial government land use policy to lease marginally arable crown land for hay and grazing, forestry, recreational uses and wildlife reserves are seen as the principal reasons for lack of present expansion of cropland in the province. Future expansion of cropland base will likely proceed into the climatically more favorable Southeastern-Interlake-Westlake region before expansion is likely to occur in the Pasquia and northern clay belt areas.

Crop yield statistics available for the Pasquia and northern clay belt indicate that potentially economic yields of cereals, oilseeds and forages can be produced in these areas.

Possible future full-time farming in the clay belt will probably take one or a combination of three forms - cereal and oilseed production or a cow-calf operation or limited specialized production of alfalfa, grass and potatoes for seed.

The most useful soils are the clays in the south and the large area centered around Thompson - there's a belt that surrounds Winnipeg resulting in cool humid conditions and poor drainage. The Pas sits in the middle of this wide permafrost area.

To look at some soil climate temperatures. The mean annual soil temperature of 50° C gives us a guide to assess what's happening across the province. The area that exists below the 8° C line are areas that are productive in cereals and forages. The station at Wabowden suggests that it's not a suitable area for wheat, flax, etc., but coarse grains, rapeseed, forages and vegetables can grow in this belt. We think this line just north of Thompson is too restrictive for most of the coarse grains that would survive between Thompson and Wabowden.

In attempting to project what this land base might provide, I think it's a bit risky. Currently Canadian agriculture output is capable of satisfying domestic and available export markets for most cereal grains, and all seeds and livestock products; in fact total output of agricultural products in Manitoba has increased despite the fact that conversion of unimproved land has been negligible since 1971. Current high cost of production in relation to low prices for farm products do not provide an environment for expanding croplands into these marginally arable areas. The necessary higher capital and operating input costs will dictate higher costs of production in these areas.

Government policy has been to retain forest land, and land with apparent low agriculture potential in public ownership. There are large tracts of arable land, but because of long term leases to pulp and paper interests, the desire to move into other areas doesn't appear very attractive in to-day's economic conditions. If there is to be an agricultural future for the North, I think there are a number of reasonably viable options. One would be coarse grain and rapeseed. The Peace River area, the northern clay belt areas of Ontario and Quebec suggest this. Another possibility would be a cow-calf operation, if this were conducted by people who were in feeder business in southern Manitoba. They could provide feeder cattle at a much lower cost of production in the North. A 3rd possibility would be specialty crops, for seed such as potatoes, legumes and grasses, especially in the more desirable lands between Wabowden and Thompson.

While it has been demonstrated that rootcrops may be grown up there, it is questionable whether they can compete on a year round basis with such crops more cheaply produced in the South. A very limited crop in the north also makes them negligible for commercial purposes. If you go on the basis of a report written by Therrien and Jim Portree, we only need 500 acres to satisfy 100% of the vegetable market in the north. Vegetable growing in terms of real agricultural production for the province would be negligible.

(Thank you)

"WATER"

Paul Rennick, speaking on "Water as a Food Resource"

Introduced by **Dale Stewart,** Deputy Minister of Northern Affairs:

> Paul Rennick is Head of Environmental Department, Acres Consulting Services. He has edited 12 or more papers dealing with Canada's natural resources, worked for Alberta, worked for Ontario. He is here today to give us some idea of how many lakes and rivers might offer something to us.

I feel like a mosquito at a nudist colony; I know what to do but don't know where to start! I have tried to pick out a few examples in data that seem to indicate productivity in water.

I appreciate the opportunity to participate in the conference. I have summarized selected data on water for Northern Manitoba and east of Lake Winnipeg, i.e. those parts of the province beyond the traditional agricultural community.

A systematic and comprehensive data base for water as it relates to biotic production in lakes and rivers is not available. I have chosen from the available information selected quantity data that indicate, in a general way, biotic productivity and thus the capability of water as a food resource. Most of my examples relate to the production of fish as the food commodity.

General Background

Water, of course, is available in several forms, i.e. precipitation, lakes and rivers, and groundwater. Except for passing remarks, I will confine my discussion to lakes and rivers.

As a society we need energy, food, shelter, jobs and incomes, recreation and cultural activities to survive. Needless to say, in our cold northern climates some of these basic physical needs are more critical than others.

Clearly, a balance is needed between these basic needs, and an adequate water supply is critical to this balance.

There does not appear to be a lack of water in Manitoba north or east of Lake Winnipeg. In fact, for the most part water is found in excessive amounts occupying a large percentage of the area in the form of lakes and rivers, wetlands (i.e. bogs, fens, etc.) and, as indicated by Bob Smith, in poorly drained soiled areas. Rather than looking at this abundant water supply as a limit to traditional agriculture, I have attempted to examine the suitability of the lakes and rivers for biotic production. Biotic production in this case means plants or animals grown in water and used as food.

For water to be useful in food production, it needs to be consistently available in quantity and quality when needed. For some crops a year-round water supply is not required. For example, if the food is fish grown by aquiculture (fish farming) methods, water is most critically needed during the growing season. The lake can be harvested in the fall and restocked in the spring and left to freeze to the bottom in the winter. Other aquiculture methods require year-round production and water supply.

It seems rather redundant to remind you people that the climate in northern Manitoba is continental with warm, short summers, and long. cold winters, with low precipitation. Hugh Fraser will be addressing the climatic realities for food production. One fortunate climatic fact is that while the average precipitation is only 16 to 18 in., about two-thirds of the yearly amount falls as rain during the summer. I might add in passing that weekly and monthly data analyses are more indicative than yearly averages, (although both are useful), when it relates to biotic production. For instance, for wheat production, if there were a trend for a killing frost in mid-July, then this event would cause serious limitations for commercial agriculture. The yearly average would mask such a limiting event and give the land use planners a better picture of the agricultural suitability of the area than closer examination would indicate.

Manitoba is not an island unto itself when it comes to water. For instance, parts of northwestern Ontario and northern Minnesota drain into Lake Winnipeg. The Saskatchewan River finds its origin in the Rocky Mountains of Alberta and a lot happens to it in terms of quantity and quality before it reaches the Pas.

On the other hand, little of what happens in the major river systems affects the many lakes and wetlands north of the fifty-third parallel since the deranged drainage patterns characteristic of the Precambrian Shield have left little connection between water systems. The lakes are, however, part of smaller watersheds which are affected by local land uses.

All lakes and rivers are subject to atmospheric pollutants, and the long range transport of air pollutants in the form of "acid precipitation" is now of great concern for many parts of the world. Because of the location of northern Manitoba in relation to the industrial activities in North America, you are reasonably well protected. Your main potential source of acid rain is from the Athabaska Tar Sands which would have to increase production many times beyond the present levels before effects would be detected in northern Manitoba.

In addition to your preferred geographic location with respect to air pollutants, there is a natural occurence which provides some protection from acidification. Over half of the waters in Manitoba are calcareous with a pH of 7.5 6o 8.5 or greater, which means they are well buffered from sulphuric and nitric acid, the main culprits of acid rain.

This does not mean that you can sit back unconcerned about long range transport of air pollutants. It does means that you are better off than the Shield country in parts of Ontario where the natural pH of lakes is 5.5 to 6.0 and they lie in direct line with pollutants from the industrial heartland of North America.

Lake Chemistry and the Physical Land Base

The chemistry and thus the productivity of lakes is very much influenced by the physical makeup of the land around it. The calcareous nature of the waters in parts of northern Manitoba can be attributed to glacial Lake Agassiz. While much of northern Manitoba is Shield country, covered with clay, much of it was covered by a freshwater, postglacial lake. During this time, an annual layer of clay and silt was laid down in the bottom of Lake Agassiz. When the lake receded to the present Lake Winnipeg, much of the area in the Shield country was left with a layer of clay, high in lime, which gives rise to the calcareous nature of the lakes in the area.

The nature of the bedrock contours, i.e. whether flat or irregular in relief, and the extent of glacial deposits over the bedrock influence the depth of lakes. Much of the area is relatively low relief and as a result many of the lakes are shallow (less than 5 m deep), or moderately deep. With respect to the productivity of the lakes for fish or other plant and animal matter, relationships are such that given equivalent nutrients levels, a shallow lake will be more productive than a deep one. With respect to fish this is a function of a greater percentage of the lake available for food production, i.e. shallow areas where aquatic plants and animals abound, and where habitat is provided for spawning and rearing of fish.

Fish biologists use these relationships, i.e. the mean depth of the lake and the lake chemistry (resulting from the land forms and soils of the drainage area), to indicate the general potential of the water to produce fish. The panel on fisheries will discuss this in more detail.

In the forest zone of freshwater lakes the Total Dissolved Solids (TDS) range from 200 5to 500 ppm, and providing other factors such as pH and depth are satisfactory, these lakes were recognized as eutrophic, i.e. fertile and productive. The TDS contain a high proportion of carbonate and calcium which gives these waters a high pH, i.e. they are well buffered against acids, A lake can, of course, have too many nutrients and TDS i.e. saline lakes, which would be limiting to bitoic production. Such lakes can be found in the Prairie region.

The northern lakes, on the other hand, which lie on the Precambrian Shield were observed as oligotrophic, i.e. low TDS, deep, cold and slightly acid, thus low in productivity.

In preparing for this discussion, I have taken a closer look at the physiography and water situation on northern Manitoba. Using data from the Federal NAQUADAT data base[3], the Provincial Fisheries Fact Book[4] and the Provincial Water Quality Status Report[4], I have plotted for a few lakes and rivers, the pH and TDS. I might add for the scientists in the audience that the Federal and Provincial figures correlated very well.

As pointed out earlier, postglacial Lake Agassiz has influenced the chemistry of the water and made it more productive than area not covered by calcareous clays and silts. For instance, TDS ranging from 50 to 175 ppm are found combined with pH of 7.7 to 8.0. This combination with suitable depth and temperature makes many of the lakes in this area reasonably productive.

The far northern lakes appear more representative of Precambrian lakes with pH ranges from 6.7 to 7.5 (slightly acid to neutral) and TDS low, at less than 25 ppm. This chemistry combined with a colder climate and deeper waters makes the far north a much less attractive area for investments in fish production.

Present Use of Water

Our discussion would not be complete without a brief look at present uses of water. Of course, as we all know, water is used in many ways, i.e. for transportation, for diluting sewage, as a coolant in industrial processing, for the generation of electricity, as a heat storage medium and for various recreation activities, to name a few.

In northern Manitoba, Indian communities have always relied on water resources for their livelihood. The location of the Indian communities was largely influenced by convenient water transportation systems and the availability of a fishery.

Communities such as Thompson, Lynn Lake and Flin Flon have developed around the mineral industry which requires extensive amounts of water for process cooling and settling of tailings pond sediments.

I will not dwell on the many uses of water except to remind us all that although water is a renewable resource, quality must be maintained to ensure that future water supplies are not polluted and that water continues to be available for its many uses including food production. I have selected for discussion two uses of water that relate to food production -- the fisheries and the generation of hydroelectric power. Electricity is essential for modern agriculture and food processing. Manitoba has enormous hydroelectric potential. The developed and undeveloped potential is in excess of 9,600 MW. All of this potential (except for 560

MW) is found in the north.

Development of hydroelectric power in the north began in 1952 with the construction of two smallplants in the Laurie River with a combined capacity of 10 MW. The main development began in 1961 with the construction of the Kelsey station on the Nelson River. Subsequently, generating stations have been constructed at Grand Rapids on the Saskatchewan River, three more on the Nelson River at Kettle Rapids, Long Spruce and Jenpeg. Part of this development included the diversion of the Churchill River as well as the regulation of Lake Winnipeg by means of the Jenpeg control structure and ancillary channels.

The remaining potential is found on the Nelson River (and the Burntwood River). There is also some additional potential for hydroelectric development on the Churchill River at Grandville Falls, the Seal River and the Hayes, which is not marked on the map.

The development of the hydroelectric potential has had, and will continue to have, a significant influence on the communities in terms of a supply of energy, employment and the development of road access. At the same time, additional effects have been created by changes in water flow regimes. For instance, diversions have increased flows, reservoirs have ponded water and dams have altered flow patterns. These changes have affected the fisheries resource and the water transportation network in the river systems.

I will not attempt to describe the operational mode of each installed hydroelectric plant. To give you some understanding of the changes that take place, I will briefly discuss the two developments closest to The Pas.

Grand Rapids

The Saskatchewan River, as stated earlier, has its headwaters in the Rocky Mountains of Alberta. It enters Manitoba approximately 20 miles northwest of The Pas and discharges into Lake Winnipeg near Grand Rapids. The total area drained at Grand Rapids is approximately 130,000 square miles. The mean annual discharge of the Saskatchewan River is 25700 cfs.

The hydroelectric development at Grand Rapids was completed in 1964. The present Cedar Lake was created by flooding approximately 800 to 900 square miles. The level of Cross Lake was raised 23 feet and Cedar Lake by approximately 7 feet. Under normal operation the reservoir is operated within a 10 foot range from elevation 832 to elevation 842 feet.

Jenpeg

The level of Lake Winnipeg is controlled by means of the Jenpeg control structure. The upper Nelson River includes the reach from Lake Winnipeg to Split Lake. The flows in this reach are controlled by the Jenpeg structure. Included with the Jenpeg control structure is a hydroelectric generating station with an installed capacity of 120 MW. Normal operation of the forebay is in the 8-ft range from el 706 to 715 ft.

These two examples illustrate that the use of water for one purpose may effect other uses. For this reason, it is essential that any major use of water be planned in consideration of the total resource potential including both positive and negative impacts so that enhancement and migigative measures can be designed into the scheme and optimium use of the natural resources is achieved.

I have divided the fisheries data into Commercial, Sport and Domestic activities. (Domestic is use of fishery by Indians for their own food resource.) I have plotted this data for only a few of the lakes. The following trends are apparent.

1. There is more Commercial fishing where the lake productivity is higher even though quotas have been set for lakes all over the provinces.

2. Domestic uses occur where Indian communities exist - which one would expect.

3. Sport fishing occurs less often in combination with Commercial fishing, which is likely a good practice since the two uses do not mix very well.

4. The large lakes tend to be Commercially fished.

5. The most intensive Sport fishing is close to communities -- which one would

expect.

6. A lot of potential for Commercial fishing exists, but it is not being used, likely due to lack of transportation and markets.

One would expect more commercial fishing where lake productivity is higher. I am unaware whether this is due to better fish catch per unit of effort, or whether these lakes are more accessible, closer to markets, or all of these. Perhaps the panel on Fish can clarify this. Clearly, the natural fishery appears to be underutilized as a food item. Hugh Fraser will be dealing with aquiculture I will merely indicate here that the quality of water in the small lakes and ponds indicates good potential for fish farming. Furthermore, use of small waters for fish production avoids the use conflicts that may occur in rivers or larger lakes. Considerable water is available for food production in lakes and rivers, however, a comprehensive inventory of water in northern Manitoba is not available. Activities in the major river systems have little effect on the inland lakes due to the deranged nature of the drainage pattern. Therefore, one should concentrate on lakes for potential food production.

Except for future development in the Athabaska Tar Sands, northern Manitoba is well situated geographically to escape the air pollution caused by the industrial regions of North America. In addition, many of the waters are well buffered against acid rain.

Indicators of lake productivity such as Total Dissolved Solids (TDS) and mean depth, show good biotic production potential except in the far north. Presently, the waters of northern Manitoba are underutilized for food production and there is a clear need for integrated resource planning to optimize the use of the resources. I haven't mentioned water as a storage system for solar heating, and that's a very practical use.

(Thank you)

"WEATHER"

Hugh Fraser, speaking on **"Weather"**
Introduced by Dale Stewart, Deputy Minister of Northern Affairs:

> **Hugh Fraser** is Chief of Scientific Surfaces Environment Canada, is concerned with water management, frost prediction, and weather as it relates to mosquito outbreaks.

"WEATHER"

To produce food requires suitable land and suitable weather; and in this regard climate is a resource, an existing supply which we can, at least in most cases, draw. It is fuel for our agricultural production system in the same way that fossil fuel is so vital to our manufacturing industries.

In examining this resource I have chosen the following approach. First, I would like to compare the climate of this northern area with that of more southerly regions where agriculture is well established, and in this way identify the differences or frankly, the deficiencies of the northern climate on relation to agricultural endeavours. Then I would like to suggest possible ways of overcoming those deficiencies, of exploiting northern climate in support of agricultural production.

It is not my intention to cover this subject in great detail or over a large geographical area. It seems prudent for example to concentrate on the possibility of extending known agriculture practices northward into the Boreal forest area, rather than to attempt the more exotic leap into the taiga and tundra. Similarly, my concentration will be on the use of the existing climate; the inviting possibilities of artificial climates such as those in green houses will be well covered by others.

We must be aware that an assessment of northern climate based on hard data will suffer because of the scarcity of that data, There are relatively few weather stations in the north and very few of these have been maintaining a record of climate for more than 25 years. Fortunately, there are some 35 years of record available from The Pas itself. There are questions as to how much area this weather station can represent but nevertheless, it is the best we have and bolstered by a few shorter records we can make good use of this valuable history.

What should we be looking at? Basically, plants require from the atmosphere heat, moisture, and light in appropriate amounts and distributions; and cannot accept damaging events such as frost, hail, and strong winds. Heat we can judge from temperature using it to calculate growing degree days, daily and seasonal ranges, and frost-free seasons. Moisture would be best understood if we had sufficient data on soil moisture, but since we do not, our inferences must be drawn from precipitation and to some extent evaporation. Statistics on sunshine and cloud amounts are available in usable if not generous quantities; so is information on strong winds and hail.

When assessing climatic elements attention should be given to interannual variability. For example, the usefulness of growing season precipitation is limited by its reliability, i.e. one must be able to count on receiving some minimum amount in most if not all years.

My general observation is that the reliability of the precipitation and temperature in the north is just as good as in the south, sometimes better. My views are those of a meteorologist and a climatologist. Although I will make occassional reference to soils, surface water, agriculture and economics, detailed comment on those areas are left to the appropriate expert.

Mean temperatures are consistently lower at The Pas then at Brandon but the difference is more pronounced in winter. Brandon is almost 4 degrees Celsius warmer in January but only one degree above The Pas in July. Over the season May to September the difference is about one and one half degree Celsius. Thus, although, the colder northern winters may restrict perennials and animal husbandry there is room for optimism regarding the growing season.

It would appear that the characteristics of the agricultural climate of northern Manitoba can be broadly stated as follows:

- Moisture is sufficient, in fact is locally more than sufficient.
- Available light is very close to that in the South.
- Violent hazards are less frequent in the North.

- The significant northern deficiency is in the areas of heat energy as indicated by parameters such as growing degree days, frost-free season and soil temperatures. The heat energy area is also that in which inter-annual variability may play a more significant role than in the South; to date this variability has not been clearly defined.

I believe that the climatic differences are small enough that we can optimistically examine means of overcoming them. In doing so, we should not expect that climatic differences if overcome, will make large areas available for farming; there are not great plains or broad fertile valleys to be exploited. Eley and Findlay in a comprehensive look at the agricultural climate of the southern portions of the North West Territories and the Yukon, concluded that there are no extensive areas having a suitable climate for subsistence agriculture. They did estimate, however, that there are many thousands of hectares on which a wide variety of vegetable and forage crops and a few grains can be grown. We should expect something similar in northern Manitoba and some directions we should point follow.

The history of agricultural progress in this country shows remarkable and continual achievement in adapting plants and animals for use in the Canadian climate. Even as a meteorologist I feel safe in predicting that given the motivation and resources, agricultural scientists can develop varieties which may be profitably produced in a slightly cooler climate, one with a shorter frost-free season, a little less sunshine, etc.

This is also an appropriate point to mention climatic change. From time to time we hear forecasts of pending changes in our climate due to natural causes or the activities of man. This complex and controversial field will not be treated here except to point out that the trends which are theorized are for the most part over very long periods of time. In my opinion, the agriculturalists will be able to adjust to these slow trends.

There are numerous examples of cultural practices which are meant to shelter plants or gather heat, particularly in the Spring; deep furrows and protective caps or sheeting are some. There are others such as minimum tillage and summer fallow which are meant to mitigate against soil moisture deficits. Again, the ingenuity of the agriculturalist should continue to serve us well.

To this point, little specific mention has been made of livestock production. This is partly because such activity depends on the local production of feed for efficiency and also because the rest of the problem concerns energy. In a colder climate - and here is where the northern winters become important - energy must be supplied either as extra feed or as external heat, or both. The solution to the former is crop-related. The latter requires a look at local fuel sources since the importation of conventional fuels would not be attractive. The development of wood and its wastes or derivatives is one possibility, solar energy is another; although the short northern days are a significant drawback, low sun angle is not. Wind power is another possibility.

The subject of "Agrotopoclimatology" has been attracting increasing attention in recent years. This rather imposing title relates the effect of local land and water structure to the agricultural climate and some very useful information is coming to light.

Shelter from strong winds provided by trees has already been mentioned; a reduction in windspeed can also bring other benefits such as a reduction of windchill and the allowance of more heat build up.

One of the most significant topographical effects is the tendency for cold air to drain into low lying areas producing "frost hollows" such as that noted at Wanless. Research in many parts of the world and in Canada by Eley and Findlay has shown that there frequently exists along valley and hillsides a thermal belt in which temperatures are higher than those in the valley floor.

Southward facing slopes can be seen to have many attractions with regard to increasing the amount of heat available. One would expect them to show higher mean temperatures (due to higher minimum temperatures), longer frost-free seasons, earlier ground thaw and more favourable light. In addition, the proper soils and degree of slope would allow soil moisture in the appropriate range for growth.

South facing slopes have a further advantage in that, tipped more directly into the direction of the sun's rays, they can receive appreciably more radiative energy and achieve higher daytime temperatures.

It is well known that the lifting of moist winds by mountains produces copious rainfalls such as will support the rain forests of B.C. In "An Introduction to Agrotopoclimatology" by MacHattie and Schnelle, it is also reported that some researchers have detected significant differences in precipitation over very much smaller obstructions such as ridges a few metres in height or even patches of forest.

Lakes are a known modifier of local climate. Open water in the Fall can prevent frost downwind not only by providing a source of heat but by creating protective cloud cover. This effect, a prolonging of the frost-free season, is apparent at many stations in Manitoba and there is some suggestion that the many lakes in the area help to mitigate Fall frost at The Pas.

In some cases, the shelter of trees or hills might be the need or perhaps the high maximum temperatures attainable in a valley bottom.

In summing up, I would like to say that we have as much moisture as we need up here, the monthly precipitation regime over the years from rivers around The Pas shows that. A major amount of precipitation occurs during the months of June and July and that gives you the same supply in the growing season as it does further south. The maximum winds, which have been recorded at northern weather stations, are sigfnificanty less than those recorded in the south. Hail is a difficult perameter to measure as it occurs in such small areas. Thunderstorms are much easier to report. There are fewer in the north, less severe, so the hazard from wind and hail can be considerably less.

Over all, we can say that the northern climate compared with the south is like this:

Sufficient moisture, slightly less light, less wind and hail, but significantly less heat. In the south the limitation in agriculture is moisture, but as you proceed north, it is temperature. The agriculturists have provided new varieties and adaptions which have done a remarkable job in producing food in this climate. I mean Canadian climate. Some of the differences are well within the capabilities of the development of new varieties. Cultural practices maybe carried out which maybe to conserve water, or maybe increase heat e.g. the use of furrowing the land in particular directions, and in vegetable gardens, the use of heat caps.

The variations between one valley and another a few miles away is probably as great as the variation I've been talking about between the north and south of the province. We can probably find areas that are suitable for many crops. For example, the side of a valley facing south may provide many attractions for agriculture in this part of the country. Radiant energy from the sun is more concentrated than it would be on level ground. The cold air tends to drain down the hillside and into the first hollow at the bottom; there's often a thermal belt on the side of the hill which is more suitable than the bottom of the valley itself.

In summing up, the differences in climate between the north and the south, the north being represented by areas around The Pas and into the boreal forest, are not so great that we should not be optomistic about finding ways of overcoming them. This is going to require a lot of work and much more data than we now possess.

(Thank you)

GUEST SPEAKER: **The Hon. Grant McEwan, Lld.**
Former Lieutenant-Governor
Province of Alberta

Regrettably not recorded, and since impromptu no copy available.

The following report appeared in the Opasquia Times, Sept. 25, 1980 issue

MacEwan Urges Inventory of Productive Land

Delegates at the North Feeding the North seminar should campaign to have a complete inventory done of all available pockets of land suitable for agriculture, says western Canadian historian and author Grant MacEwan.

Find out where the soil is and do something with it," he told delegates at the seminar luncheon on Thursday. "That's a challenge almost unequal to any today."

The 77-year-old MacEwan looked spry and chipper in spite of a "bucking horse" (delayed airplane) which got him to The Pas barely in time for his speech before the 300 delegates.

"What this conference is about is really the struggle for food," he said. "And when you look at it, that's been the historical struggle of the North American continent."

From the time the first explorer set foot on the shoreline of Hudson Bay, MacEwan continued, Canada's inhabitants have fought to obtain food. "The native people knew how to live off the soil, they knew how to prevent scurvy by drinking a brew made from spruce needles and they knew the benefits of eating liver, kidney and other animal organs."

Many white men died of starvation before they learned the Indian's ability to live off the land, he said. "The white man was slow to learn and it cost him many lives."

White men were also slow to learn the value of good soil. MacEwan said white men were convinced the North wouldn't supply them with the things they needed to survive.

They used to say things couldn't grow in areas that had permafrost. Or that things couldn't grow here because the season was too short and the area lacked good soil."

It took many decades before the continent's new inhabitants realized the agricultural potential of their new land.

We learned that while permafrost may be a handicap, it's certaily not a barrier,", he told his spellbound audience. "Today we know that at 55 miles from the Arctic Circle, you can grow the things people need. And we know this only because someone who didn't know any better planted gardens and they prospered.

The growing season also proved to be more desirable than originally thought. "We learned that even though we didn't have as many frost-free days as southern areas, every day up here counts more. We have more continuous sunshine every day than in the South."

The third factor, however, is the most important, MacEwan emphasized. "Canadians learned that while they don't have as much topsoil as similar areas at the same parallel in other parts of the world, the North does have areas of agricultural land that are highly productive."

"For instance, the Yukon has 250,000 acres that are considered arable. Yet less than 2,000 acres of the land are under cultivation.

While the potential is not huge in that area, MacEwan says it certaily is large enough to produce "one heck of a lot of food."

"We have to get more use of the soil, and the only way to do it is to find out exactly where the pockets of arable land are situated," he said. "Soil is the important thing. Once you've got the soil, you can grow anything. The problems with permafrost and a short season can be overcome."

The Manitoba-born writer urged delegates to accept the challenge of the North feeding the North. "Find that soil and use it. Develop your own food sources, not for export but for feeding yourselves."

"GREENHOUSE AND HORTICULTURE"

MODERATOR, Gary Filmon, M.L.A.

Dr. Ron Britton, Associate Professor, Dept. of Agricultural Engineering, University of Manitoba, speaking on:

"WHAT"

I must caution you that my view of what a greenhouse is, is tempered by my profession. You're listening to a barn builder, and those biases will probably come through. When I look at a greenhouse, I see a house which is essentially designed to create growth, a system that will permit plant growth, such as tomatoes in Thompson. It creates an environment; it's a machine which allows you to proceed with production. As a production system it's an intensive system, in labour, in capital input, intensive in output. If you don't get a high output, you can't afford the money to build them, It's a structure which is very energy inefficient, built to lose heat, and raise the profitability of energy companies. One of the major greenhouse growers in Winnipeg spent 1/4 million dollars in natural gas last year. But greenhouses hold a great deal of promise, and will enable us to do things we couldn't do before. At one point we didn't think of farrowing hogs in the winter, now it's a matter of course. But we must solve the energy problem. The greenhouse is not a prepackaged solution to the north feeding the north, but is an element, a part of a much larger scene. Costs can be prohibitive. We can't give you a kit of parts to take home in your brief case, can't supply all the answers you need. It all depends on location, heat supply, on the kind of plants you want to grown, and labour supply. Building is complex. What I want to do is look at the system, some of the physical constraints, it's a pig in a poke, not something that's going to work.

We get very little sun from the north, but we still build greenhouses transparent on the north side. A few years ago, a graduate student of mine did some work orienting greenhouses and came to the earthshaking conclusion that the most efficient structure has its long axis running East and West with transparent material on the south side, to let the sun in, and insulation on the north side to block out the less than 1% of the sunlight the building got. You can lose 45% through condensation.

Greenhouses used to be single thickness, in the days when energy was free, or almost. Now you find two layers to save on heat bills. If we orient East and West, with a double layer of translucent material on the South, and insulate the life out of the North, you make a 50% saving. We get the sun in, then must ensure we have a 20° - 25° C range; the vast majority of Canadians must add heat. Options available are insulated night curtains, saving 30 - 40% of heat at night. These are fastened at the top and bottom, and are a pain in the duff to manage, but probably save 40% of your heat. A friend, Ted Short in Ohio, is working on a bead wall - at night he pumps the space between the double skins full of styrafoam beads. It's not commercial yet but in a year or two we may build a greenhouse with a transparent wall in the daytime, and the high insulation at night.

Since fuel prices are going up, people are looking at waste heat studies. Dr. Kraft has information on cost. As a general rule, you are in a situation where you save on the cost of heat, but lose on the cost of equipment to upgrade that heat. If you wanted to start building and you asked me where to put your money-in waste heat or energy conservation, I would say energy conservation, like Ted Short's bead wall. Another thing we must look at is solar energy. It has a lot of potential but is only available in its cheapest form when the sun is up - when we need it least. Come midnight at -40° there is little solar energy so you must store what you picked up during the day. The cost is terrible. A lot of work needs to be done to save the greenhouse energy in the south, and to introduce it in the north. I think the potential is tremendous - if we have the wit to design the system to cope with the environment in which it finds itself. And if people operating the greenhouse have the skills and attention to detail to operate a very complex, unforgiving production system.

The first year you build everything seems fine, the fans don't even break; the second year things are a bit dicey; the third year you overcome the jinx or go broke, because the intensive system has had time to produce things. If you're not good, count on being in business 3 years. The thing has to be designed to fit - you don't take a greenhouse causing people to go broke in Southern Manitoba and set it up in Thompson, but if you're prepared to design it to fit, we can go a long way in saving energy. There is a potential for food and aesthetic crop production, so you don't have to pay the ridiculous air freight bringing in stuff from the South. You're a market for our product.

(Thank you)

"GREENHOUSE AND HORTICULTURE"

MODERATOR, Gary Filmon, M.L.A., introducing

Mr. Wayne Fraser, Director of Safety and Environment, Hudson Bay Mining and Smelting Co. Ltd., Flin Flon, Man., speaking on:

"WHERE"

I'm a 30 year plus resident of the north and an engineer. My paper is one of many things, some science, some professional experience, some backyard experience, and a large measure of fokelore, old wives tales, or perhaps to-day it's old person's tales.

The North is a relative thing - Walter Perepeluk tells me the geographic centre of Canada is at Baker Lake, which means we're all in the South. I plan to talk about the Precambrian Shield area to the north and that part of it. Within The Pas area, and some interesting operations in the Wanless area, which have a growing season of 65 days, there's a successful greenhouse operation which is combined with a field operation - a "pick your own" produce operation, it's been running for a number of years. In the Carrot River Valley there are similar operations.

Those of you who live in the North and, like me, appreciate the flavor of vine-ripened tomatoes and garden-fresh produce are well aware of the problem that faces us for some ten months of the year - acquiring produce resembling to some degree the garden-fresh variety. Rather, we are forced to choose from a limited variety of high-priced, plastic-textured, flavorless vegetables originating from several hundred to several thousand miles away.

The problem is simple in origin - we in the North have an outstanding growing season which, at best, is 100-125 days. This problem is compounded by secondary factors - lack of natural soils in some areas, arid summers or prolonged cold and damp spells, and the usual bugs, diseases, hail, wind. So how can these problems be solved?

I suggest that greenhouses, based perhaps on hydroculture rather than natural soils, could provide a solution. And these greenhouses could be operated in an economically-competitive fashion through the use of waste exhaust heat from the industrial operations presently running in Flin Flon, The Pas, Thompson, Lynn Lake, Snow Lake, and Leaf Rapids.

Viable agriculture soil occurs naturally in few places in the Flin Flon area and, where it does, it varies from sandy clay to sandy loam. This variety alone presents a challenge which oft times beats the novice gardener. The majority of gardens and landscaped yards in Flin Flon are based on soil conjured by a combination of skill and alchemy from the materials available - raw peat or acidic muskeg, sand, and clay. The proper balancing and mixing of these constituents with neutralizing agents and fertilizers often takes many years before a completely satisfactory growth media is achieved. In recent years, the importing of loamy topsoil from The Pas has become increasingly popular as a means to acquiring a soil material. We also import a lot of weeds.

The normal frost-safe period - late May to early September - combined with insufficient growing-degree days, prevents the successful outside growing of many crops in most years. Some summers, such as the current one, may be exceptionally long for those who gamble on early planting, and certain areas of the city have particularly advantageous micro-climatic locations. For the most part, however, corn, cucumbers and numerous other varieties of vegetables and essentially all tree fruits cannot be cultivated in our area. Still others such as tomatoes only field-ripen a minority portion of the total yield.

The development of special early varieties has greatly assisted horticulture, and the appropriate choice of varieties can ensure good yields for many types of produce in spite of our climatic limitations. More work should be done in the development of additional varieties for the north. Clearly, however, the small market potential makes this development unatttractive to commercial seed houses.

Commercial field agriculture does not appear to have economic feasibility in the Flin Flon area. Multi-acre plots of cultivatable land do not exist. Construction of acceptable plots through leveling and provision of topsoil is prohibitively expensive - a minimum of 15 to 20 thousand dollars per acre. Clearly, an acceptable financial rate of return on such an investment could not be realized from a single crop each year.

Hand tending and harvesting of many field crops is too expensive, while mechanization requires large acreages to justify. The comparatively small regional Northern market means that export to the south would be required to provide commercial outlets for the yield of large single-crop operations. Potentially lower yields in the North, combined with transportation costs, would prevent effective entry into these southern markets. Southern-produced crops, on the other hand, can be produced by larger and therefore more cost-efficient speciality operations; this combined with larger yields would allow transportation costs to the North to be absorbed while landing produce at retail at prices still lower than those which would result for northern-produced items.

What of the potential of private gardens? Let me discuss briefly two of these: my own personal garden as an example of an average home operation, and a larger garden operated by Hudson Bay Mining and Smelting.

Last summer, from my plot of less than 600 square feet, the following was harvested: 100 pounds of tomatoes, 70 pounds of carrots, 40 pounds of potatoes, 30 pounds of rhubarb, 20 pounds each of beets and beans, 10 pounds of peas, 8 heads of cabbage and cauliflower, and assorted quantities of radishes, lettuce, onions, brussel sprouts, and various spices and novelty crops. Intensive cropping, certainly, and many items such as tomatoes did not field mature. But none-the-less, the yields were on par with those of more temperate climes and well indicate the horticultural potential of the area. I should perhaps add that the garden is located approximately five miles south of Flin Flon, and that the soil is "home made" - a mix of peat muskeg, sand, clay, organic compost and chemical fertilizers.

On a somewhat larger scale, a garden at the Phantom Lake resort area one mile south of Flin Flon has been maintained by Hudson Bay Mining and Smelting for many years, and produces from less than one-fifth of an acre all vegetables for some twenty five people during August and September, and considerable quantities of produce for storage and use into the winter. Normal crops include tomatoes, celery, cabbage and cauliflower from bedding stock; and beans, peas, potatoes, radishes, lettuce, carrots and onions from field start.

I have been talking about the specifics of agriculture in the Flin Flon area. How does this discussion relate to other Northern Manitoba areas?

Private horticulture is possible in all centres, presuming that appropriate use is made of bedding stock and sufficient attention is paid to proper variety choice. Commercial field agriculture, on the other hand, is faced with an array of problems. Thompson, Lynn Lake, and other areas further north of Flin Flon would appear to have one primary and defeating problem - too short and too cold a season. Additionally, poor soil or the absence of cultivatable areas plague most of this portion of the North.

In parts of the North, south of Flin Flon, certain types of commercial production are possible and in fact are in operation. The comparatively short growing season coupled with the extensive cost of cultivating crops started as bedding stock, limit this production to the more hardy and the quickest-maturing field-seeded crops - potatoes, cabbage and the like. The exception is several smaller "pick-your-own" operations which include peas, beans, lettuce and other produce.

What, then, is left to the North in terms of horticulture? Greenhouses, I submit, possess both private and commercial possibilities.

I will not deal with the operation of small private greenhouses. Rather, let me briefly outline what a greenhouse complex, on a commercial scale in a location such as Flin Flon, might involve. The background for my concept includes Hudson Bay Mining and Smelting experience in medium-scale greenhouse operations for many years, discussions with a Northern-based commercial operator, information from undertakings in other areas, and a basic approach to energy utilization and agricultural techniques.

For many years, Hudson Bay Mining operated several thousand square feet of greenhouse at the Phantom Lake summer resort area. The house served a two fold function: providing 3000-4000 bedding plants and shrubs for the resort and for Company grounds landscaping, and providing fresh produce to staff accommodation. A portion of the house was maintained year-round through the use of artificial light and heat, while the remainder was maintained for approximately six months. These greenhouses by mid-1970 required extensive renovation and, due to a shortage of labor and increasing operating costs, have been shut down since then except for short-term spring use to hold purchased bedding stock.

HBM&S experience, coupled with that of other operators, indicates that a conventional solar greenhouse can be operated for approximately six months of the year without use of supplemental heating or lighting. This period of time allows most produce - tomatoes, cucumbers, peppers - to come to maturity from seed and produce harvestable crop for two to three months. Annual yields for tomatoes and cucumbers are in the one to one-and-a-half pounds per square foot of greenhouse. Extension of the season to ten months through use of supplemental heat could at least triple this yield; use of hydroculture could increase it even more. In theory, a twelve-month season could be created through use of artificial heat and light.

However, operational testing of this approach in Calgary has indicated that only a ten month season is commercially achievable, although a plant "holding" rather than plant "growth" environment could be established at minimal cost during the December-January period.

Can these houses be operated as commercially viable enterprises? I believe that they can, and the basis for this success rests with the availability of low-grade waste heat from industrial complexes. More pilot-scale work has to be done, but initial results from several quarters have to be considered as encouraging.

At the Bunker Hill Mine in Kellogg, Idaho, extensive growth chambers are operated over 300 feet underground in old mine workings, to produce seedling trees for use in revegetation of mined-out surface areas. The constant 24 deg. C temperature and 100% humidity condition of the mine is enhanced by high-intensity multi-vapor quartz lamps to provide ideal growing conditions. Two successive crops each year produce several hundered thousand seedlings, at a cost of approximately one-third that charged by commercial nurseries.

British Petroleum Corporation has recently started up several thousand square feet of conventional greenhouses adjacent to its petroleum refinery in the Montreal area, and utilizes previously-wasted hot water at 37 deg. C to heat the houses. Three successful tomato crops have been produced so far, and testing of mercury vapor artificial lighting is just commencing. The overall study is jointly funded by the Federal government.

At Hudson Bay's Flin Flon complex, conditions similar to both of those just discussed are present. Worked-out underground areas exist, while larger quantities of underground ventilation air is exhausted to waste. Unfortunately, these areas are not readily accessible, while the temperature of these areas and the exhaust air are not ideal for growing, being as low as 5 deg. C in the winter. Clearly, however, an air mass at this temperature is significantly more attractive for heating than winter exterior air at negative 40 deg. C. Associated with our surface refinery operations, a cooling tower in operation year-round receives water at a temperature of approximately 37 deg. C, and exhausts to atmosphere low-grade heat equivalent to the burning of some 1000 gallons of fuel oil per hour.

The greenhouses I envisage would be 20-24 feet wide, several hundred feet long, and constructed of double-layered plastic on wooden frames. Units could be "stacked" horizontally, or north walls could be of insulated solid construction. Thermostatically-controlled blowers would provide cooling; the same units equipped with hot water coils and directional ducting could provide heating. Buried piping carrying hot water would provide a means of soil heating, while a trickle irrigation would provide both moisture and balanced nutrient additions.

On a rough cost estimate, these structures could be erected for less than $10 per square foot; operating costs, including 10-year straight line depreciation, would come to between $4 and $4.50 per year per square foot. A total product value of $5.50 to $6.00 per square foot would allow a 15% rate of return on minimal artificial lighting, on no charge for the earlier-discussed heat, and on a total of 16 000 square feet of greenhouse area. The actual area that could be viably operated would require detailed study and market potential determination, but sufficient heat is currently available from the Flin Flon cooling tower alone to maintain 20 deg. C under the coldest winter conditions for over five acres of greenhouse.

In summary, then, I feel that commercial field horticulture involving diversified crops is not viable. Private gardens fulfill a need, but are not able to satisfy the complete demand and require more hardy varieties. Greenhouses, heated by waste industrial heat sources, seem to possess attractive commercial possibility, and well deserve additional evaluation.

I would like to tell you that John Bodner is selling stock in a new company; it should solve two problems we discussed earlier today. He's got a concept that utilizes spruce boughs and moose droppings, to produce a scurvy-preventing dinner wine!

(Thank you)

"GREENHOUSE AND HORTICULTURE"

MODERATOR, Gary Filmon, M.L.A.

Ms. Ellen Heale, Horticulturist, Inco Metals Company, Coppercliff, Ontario, speaking on:

"WHERE"

Other speakers at this conference have pointed out the many valid reasons for developing a vegetable producing program in the North. This applies very specifically to the production of those vegetables which are difficult or costly to transport due to their fragility or bulkiness in essence the salad vegetables, tomatoes, lettuce and cucumbers.

Yet the people who are pioneering and developing the mid-north in Canada, should be able to have the same standards of living, as those who live in the more Southern areas of Canada. One of these standards is access to the same foods.

In recent years, the availability of salad vegetables on a year round basis has become a desirable standard.

For this reason, tomatoes and cucumbers were selected for our basic research program at Inco. Since then muskmelons have been added as another possible crop.

In addition to the site requirement of being close to a heat source, the other requirements are an adequate electrical power supply and a reliable supply of potable water. Easy access to the site facilitates the carrying out of the project.

In and around mine and smelter sites there can be many forms of waste heat energy available, the number will vary with each site. Compressor cooling or process waters are forms of heat energy generally available, but they are subject to interruption by mechanical failure, work stoppages or process changes. This requires a standby heating system capable of supplying all of the heat required. This is a capital cost, for which the carrying charges could render this system economically now viable. However, cultural procedure under this system, in a greenhouse designed to conserve the maximum amount of heat energy, would be standard and are currently in use in commercial greenhouses.

Due to the potential unreliability of this type of heat source, the program at Inco's Copper Cliff operations was initiated to make use of a constant heat source or one which can be handled in such a manner that interruption will not affect production.

In the Sudbury area, the utilization of geothermal heat was the answer in our opinion. As a general rule, for every increment in depth below the surface of 100 feet, there is a rise in rock temperature of 1^{o} Fahrenheit. The temperature of the surface 100 ft. has a year round average of 40^{o} Fahrenheit.

Two experimental programs, one below ground and one above ground were initiated to develop a procedure to use this heat energy for growing vegetables. The fact that current heat energy costs of greenhouse operation constitute slightly over 50% of total production costs certainly makes the use of this heat source an economically viable alternative.

Our underground experimental site at the 5600 foot level of Creighton #9 shaft has an average temperature of 78^{o} - 80^{o} Fahrenheit.

Although we have found this temperature range to be high for tomatoes, it is certainly favourable for english style cucumbers.

The use of underground areas is only feasible in operating mines where hoisting facilities are available. Changing mine production programs necessitate that the "Greenhouse" program be developed in such a manner that it can be moved to other sites and not impede mine developments or production. Normal cultural procedures of using automated watering and feeding systems are advisable to minimize labour requirements.

Our underground research is directed at light relationships, the spectrum range required for plant growth the light intensity and the day length required. When we have the answers to these problems the photo period or "Day" will take place during an off-peak power demand period.

The underground program is a joint project with Laurentian Unviersity and Inco as partners with some funding from the federal government.

Changing to surface, the plant is to use the mine ventilation air, normally vented into the atmosphere as a source of energy required to heat a greenhouse. The "Where" then becomes a site close to a ventilation exhaust shaft.

Our experience with the prototype greenhouse at Copper Cliff South Mine, which uses mine ventilation air as a partial heat source, is proving successful and plans are being developed to build a larger test greenhouse (150' x 30') using this principal, in 1981.

A rock heat sink underneath the greenhouse, along with the insulating effect of having a 3"-4" blanket of warm mine air surrounding the greenhouse is apparently successful. The greenhouse was designed to make maximum use of passive solar radiation. Minimum temperature in the house when no supplement heat was supplied was 44^{0} F at night during the past winter.

Production rates for tomatoes on our spring crop were slightly in excess of 5 pounds per plant. High quality english cucumbers are being produced by the 4 varieties being tested currently.

This program has been jointly financed by the Regional Municipality of Sudbury and the Inco Metals Company with the research program being carried out by the Inco Metals Company staff.

Our experience, as shown with the slides which you have viewed, indicates that both above ground and underground vegetable growing projects have great potential. There is still much to learn about techniques for the underground program and we are working on solutions to these problems. Above ground greenhouses heated using industrial waste heat are presently within the realm of reality in my opinion.

(Thank you)

"GREENHOUSE AND HORTICULTURE"

MODERATOR, Gary Filmon, M.L.A.

Dr. Daryl Kraft, Associate Professor, Department of Economics and Farm Management, University of Manitoba, speaking on:

"WHEN"

I am always glad to speak on the subject of agriculture. I grew up on the Saskatchewan River in Alberta, a long way south of here, but I hope I have something in common with you.

When will greenhouses be viable for food production in Northern Canada? Or even Southern Canada? This is of interest to this particular panel. The direction of the discussion has been toward the future, and the focus has been that of a controlled environment.

Each of the experts on the panel is looking into the same crystal ball, visualizing a different facet of this industry. The images I keep seeing have one common denominator, namely money. They appear in the forms of balance sheets, debt payments, product sales, fuel bills, wages and numerous transactions a greenhouse business will engage in. None of the images is sufficiently clear as to indicate exactly when the residents of northern Manitoba will be consuming regionally grown vegetables. However, the economic picture outlines the factors which will determine whether the northern region will continue to import or locally meet some of the demand for tomatoes, cucumbers and lettuce. The paper discusses the major economic forces which a bearing upon future development. They include the vegetable market, production costs, and the economics of energy conservation.

Fresh tomato and cucumber consumption averaged nearly 22 pounds per person in Manitoba and should increase by 1 percent for every 10 percent rise in real income. In 1978, Manitoban greenhouse production only supplied .1 percent of the market and this meager share had fallen by 50 percent over the previous high in 1976. Greenhouse vegetable production may be non-existent in northern regions but it is relatively insignificant in the southern areas of the province as well. Why hasn't the industry captured a larger portion of the provincial market? And, what factors if any indicate the growth will be more dramatic in the 1980's.

The fresh tomato and cucumber and lettuce market is dominated by imports from Mexico, California and Florida. The North American price for these products between October and July depends upon their availability. Regional price differentials are due primarily to transportation costs which are currently $.06 per ton-mile. In other words a 20 ton load shipped to The Pas from California will cost about $3,600. Given the average price paid for tomatoes imported in 1979 was $520/tone then transportation costs account for a third of the purchase price. Table 1 indicates the prices paid by wholesalers for imported tomatoes increased at an annual rate of 10 percent. Between 1970 and 1979 the prices had been more than doubled. Part of the increase was due to a 15 percent decline in the Canadian dollar and a doubling of transportation rates. Whereas tomato prices fluctuated from month to month and somewhat between years the rising price level was due to world food demands expanding more rapidly than supplies. This forced the prices of all commodities upwards and unless tomatoes earned a similar rate of return as other crops fewer acres would be grown until the price justified tomato production.

Prices paid by wholesalers for greenhouse tomatoes was nearly double that offered to the imported competition. This product received the higher price because of quality differences and buyers willing to pay the differential because of the added flavor. As greenhouse tomatoes capture a larger share of the market the price gap will close because some consumers do not place a similar premium on taste.

For the 1980's the expanding world demands for food will continue to require a growth in agricultural output. An optomistic scenario has supplies just keeping pace but at rising prices levels similar to the 1970's. Therefore, vegetable prices should increase at 10 percent annually and possibly higher.

Conventional greenhouse production patterns are confined between periods of March to July and September to early December. Insufficient light levels and peak heating requirements during the winter months prove to be uneconomic. The high temperature of July and August reduce yields by fruit malformations, poor pollination and vigor. During the spring period tomato yields should average 10 pounds per plant or 2 lbs/sq. ft. of greenhouse area. In the fall the yield drops to about 1 lb/sq. ft. for a combined yield of 65 tons/acre.

Under field conditions in California the production is 14 tons/acre in the spring and 11 tons/acre in the fall. Therefore greenhouse production is about 2.6 times the competitive field output. Cucumbers are grown also during the spring period with an expected yield of 2.75 pounds/sq. ft. of greenhouse area. Because of the greater yields total revenue from cucumbers has often exceeded tomatoes by about 10 percent to 20 percent even though the price per unit is normally lower. Industry yields represent conventional practices and could be improved with better management. However, the two options of extending the growing period and raise the utilization of the facility appear most promising.

I feel improved ventilation and shading could extend the spring season for cucumbers and tomatoes through the summer and not require reseeding. Tomatoes and cucumber yields should respectively approach 3.75 and 4 pounds per square foot. Total revenue will not increase by the corresponding yield improvements because the production must compete with lower priced field crops during August and September. A low cost waste heat source also extend the growing period through the winter by producing lettuce. It has been estimated that three lettuce crops between November and February should earn approximately .75¢ per square foot.

Greenhouse production is an extremely labor intensive activity. Studies in Ontario and eastern United States indicate that a spring and fall crop from an acre of greenhouse will require between 5,000 and 7,000 hours. Time increases with crop yields and the amount of packaging undertaken. Labor requirements for field production in California would correspond to about 1,000 hours per cropped acre. Therefore greenhouse production utilizes 2 1/2 as much labor per ton of product. Assuming labor was $4.00/hour in 1979, the costs of labor per sq. ft. of greenhouse was about $.55. Whereas labor share of operating costs was the largest in the 1970's it now has been surpassed by energy in 1980. In Manitoba the 1978 energy costs were $.49/sq. ft. and were estimated at $.55/sq. ft. in 1979. Since fuel and lubrication for production and transportation of field crops is $1,100/acre, greenhouse energy expenditures are over 20 times their competitors. Other expenditures for seed, fertilizer, twine and related supplies ranged in the area of $.20/sq. ft. in 1979.

During the 1970's greenhouse operating costs increased at an annual rate of 13 percent while product prices increased 10 percent. Energy rose at 15 percent/year, labor 11.5 percent and other crop inputs 10.5 percent. Every line on the operating cost account increased more rapidly than product prices.

The absolute return to capital invested increased from $.41/sq. ft. in 1970 to $.65/sq. ft. in 1979 for an annual rate of 5.25 percent. Whereas the absolute level increased the rate of increase was insufficient to attract new capital to the industry. For example, in 1970 the construction cost of a new fiberglass greenhouse was $3.25/sq. ft. Given the intermediate term interest rate of 9 percent the debt could be repaid over 15 years at an annual rate of $.40/sq. ft. Thus the available funds would just meet mortgage payments if all the capital was borrowed. By 1975 construction costs had risen to $5.10/sq. ft., interest rates to 10.5 percent and the repayments to $.69/sq. ft. A return on capital of $.58/sq. ft. was not sufficient to attract new investment. By 1979 the gap had grown wider as construction costs were $7.50/sq. ft., interest rates 15 percent and mortgage repayments $1.28/sq. ft. A net return of $.65/sq. ft. would only meet half the mortgage requirements. Therefore, greenhouse investors prior to 1970 probably made a competitive rate of return however more recent investments have been much less profitable. In fact it is doubtful many new investments were undertaken if most of the capital was borrowed at competitive rates of interest.

Given these economic events of the 1970's what is the projected growth for the greenhouse industry in Manitoba. If price increases continue according to the past 10 years and new production technologies are not forthcoming the existing greenhouse capital will not be replaced or expanded upon if vegetables are the major crop.

However before my crystal ball becomes too gloomy let us examine the economics of energy conservation.

To reduce future energy requirements involves increased capital investments today. These could be in terms of insulation reflective surfaces, night curtains, heating systems and utilization of waste heat. The cost of the energy savings is dependent upon the increased investment required and the rate of interest. The savings depend upon the life span of the capital equipment and the rate at which energy prices increase. Table 4 shows the increased capital expenditure justified to reduce energy costs by $.1/sq. ft. in 1980. If energy expenses could be reduced by .1% in 1980 the savings in 1995 will be .81 if energy costs continue to climb at the rates of the 1970's. Borrowing money today at 14 percent would justify an expenditure of $1.25/sq. ft. Thus with current interest rates and expected rates of energy inflation for every $1 of energy saved today would roughly justify $10 of capital.

Once businessmen expect their operating costs to increase because of inflation there is a strong economic incentive to invest in capital equipment and buildings if it can reduce future costs. Capital provides non-inflationary services. Thus operations will become more capital intensive and relatively fewer people will be employed and less energy utilized.

Will energy conservation make greenhouse investments sufficiently profitable to justify the expenditure? Current greenhouse construction costs are $8.30/sq. ft. and given the rate of interest of 14 percent requires an annual payment of $1.35/sq. ft. A 50 percent savings of energy would only provide a repayment capacity of $1.00/sq. ft. in 1980, $1.29 in 1985, $1.71 in 1990 and $2.10 in 1995. Therefore, assuming the energy savings was free the greenhouse is not likely to generate sufficient revenue for the first six years to pay for the structure. For every dollar/sq. ft. the energy savings modification costs will increase annual mortgage payments by $.16/sq. ft. If the conservation of capital raises the structure costs to $10.30 the greenhouse is projected to lose money for the first 10 years of operation. Therefore expected energy savings alone is not likely to increase greenhouse investment.

Two factors must occur, energy costs reduced and revenue increased through utilization of the facility. Waste heat provides this alternative if the capital cost of utilizing these sources can be justified by the energy savings and increased output. For example if cucumbers and lettuce were produced in a waste heat the facility could cost up to $2.25/sq ft. if expected cash flows in every year were to exceed the mortgage payments and $20.00/sq. ft. if 25 percent equity capital was provided by the investor.

There's also an additional problem with respect to inflation, associated with labour. As soon as business starts to proceed in a greenhouse operation, costs are also going to inflate. A number of industries are mechanizing to reduce their labour component. Businesses are looking very sharply at reducing labour costs. In the case of energy it's a national investment, but in the case of employment of people, I question the situation where inflation could lead to a higher rate of unemployment. Fewer jobs will be created in trying to save an increasing wage bill. I think the future of the industry lies in reducing energy consumption, increasing the utilization of a very intensive capital plant; waste heat provides the alternative. It's a high capital cost source, a low cost source in terms of operation. The greenhouse would extend its growing season to about 11 months of the year. Without those two things happening simultaneously, I don't visualize you'll be eating many vine-ripened greenhouse tomatoes in Flin Flon and The Pas in the 1980's.

(Thank you)

"GREENHOUSE AND HORTICULTURE"

MODERATOR, Gary Filmon, M.L.A.

Mr. Bob Harris, Research Scientist, Agriculture Canada, Sidney, B.C., speaking on:

"WHY"

I wondered if "why" was in your minds, when someone from the mildest part of Canada would be talking about food in the north. Also "why" anyone would invest in greenhouses in the north. For 19 years I was a research scientist at Beaverlodge, Alberta, slightly north of this area. The climates are almost identical. Here at The Pas you have a cooler air and soil temperature in the spring and winter, and 10 to 16 days longer growing period. Basically it's a better area than the Peace River for growing things. During 20 years that I was associated with horticulture in north western Canada, I saw vegetables and small fruits growing under what southerners would call impossible conditions. I would like to discuss some of the techniques used to grow vegetables in regions extending from about 55°N latitude to inside the Arctic circle. The techniques were developed for growing crops outside without protection.

First, I would like to caution against assuming that a northern environment is inferior to a southern environment and making bold assumptions based on experience in more southerly climates. The northern environment is different and in some respects superior to southern environments for many crops. For example, The Pas has more hours of light during the killing frost-free period that any other location on the Canadian prairies.

I was surprised to find the climates of The Pas and Peace River regions are very similar. I'm including the long twilight.

The Pas had lower air and soil temperatures during the spring and winter, warmer temperatures during the summer, and a 16-day longer frost-free period. Everything that can be grown in the Peace could be grown here, but I understand that within a few miles the climate is less favourable for plant growth. I will, therefore, start with some of the methods used in the Peace to enhance plant growth and move gradually north to more severe climates.

Very little can be done to modify climate over an extensive area but there are several ways to ameliorate the climate of limited areas. Irrigation and heated greenhouses are two of the best known methods of modifying growing conditions. There are however, several other methods.

Shelter belts can be used to modify climates over quite extensive areas. Properly designed they divert the wind upward, resulting in reduced evaporation, higher temperatures near the ground, reduced bruising and abrasion, earlier maturity and higher yields.

One of the main criticisms of shelter belts is that deep snow drifts are formed and prevent uniform drying and early working of the fields in spring. Snow-drifts can be prevented with properly spaced shelter belts to provide uniform wind protection over a wide area. There is no doubt that shelter belts do improve the climate for horticultural crops in all areas of the north.

Corn, bush beans and cucurbit production in heavy textured soils in the Peace is limited by cold spring soils. No doubt, it is also a problem here. In the Peace, corn on heavy textured soils matures on the average only one year in seven, but if the soils are warmed up for three or four weeks corn will mature nine years out of ten. The soil can be warmed easily by applying a 1.2 meter wide strip of clear polyethlene over the soil. This raises soil temperatures by up to 9°C. Black polyethylene mulches have practically no effect on temperature or growth.

Many types of plastic shelters have been tried at all research sites in northwestern Canada. They provide very little protection against frost unless they are heated. Their main advantage is in providing protection from wind and increasing day time temperatures. However, unless supplied with automatic ventilation, the shelters must be opened and closed daily, and for maximum effect, several times a day.

Tunnels, row-tents and cloches are low shelters which have to be removed exposing the succulent growth to a relatively dry atmosphere. Unless these structures are opened and removed gradually the plants will wilt and sometimes burn severely.

Walk-in shelters are more flexible and can be fitted with heaters and automatic ventilation. I would like to see some experiments started using walk-in shelters as a combination greenhouse and solar collector. By installing fans the hot-air from the top of the shelter could be removed and pushed through pipes into the ground either inside or outside the shelter. This would increase soil temperature, speed germination and early growth, and increase rooting.

At Haines Junction, Yukon Territories there is a very short frost-free period. A frost before July 15 is considered a late spring frost and after July 15, an early fall frost. Despite the short season many vegetables and some small fruits can be grown. Walk-in shelters are used but this Station's most valuable contribution to horticulture in the north was the research they did on frost protection with irrigation. Jerry Gubbels, who is now at the Morden Research Station, found that as little as 3.1 mm of water per hour applied as a fine mist protected potatoes and peas from temperatures as low as -4.4°C.

Inuvik, at the mouth of the Mackenzie River, has a frost-free period of about 55 days but is situated on permafrost. Under the natural cover only the top 0.5 meters thaws out during the summer but with cultivation the thawed depth can be increased to about 2 meters. The cold soil is the main limiting factor but even so many of the common vegetables such as leaf lettuce, radish, etc., can be seeded directly into the ground. Others such as head lettuce, cabbage, cauliflower and broccoli can be grown from transplants. For potatoes, peas, carrots and rutabaga, however, the soil must be warmed. This can be done with clear polyethylene mulches which increases soil temperature by up to 6.6°C or a combination of raised ridges or terraces and mulching by up to 8.8°C.

Because of the short, cool season, many vegetables benefit from being started in greenhouses or other protected places and transplanted to the field. These include head lettuce, potatoes and, of course, all the Brassicas. At Inuvik, pre-sprouted potatoes have produced over 4.5 tonnes when transplanted to ridges or terraces and mulched with clear polyethylene.

In many instances, poor performance of crops or cultivars is due to one environmental factor which adversely affects growth during one or two stages of development. These adverse conditions are generally of short duration and if they can be identified, research can be concentrated on overcoming the limiting factor. In the Peace, the factor limiting production of corn was low soil temperature; of tomato, by cool air temperatures which prevented pollination; strawberries and apples by lack of late fall and early winter hardiness; and in strawberries, late initiation of flower buds which adversely affected yield. All these limiting factors were overcome in a relatively short time by modifying the growing conditions or by breeding better adapted cultivars.

Many northern areas are better adapted to growing perennial crops than southern areas because snowfall starts early and usually remains all winter resulting in warmer soils and fewer breaks in dormancy. In both the Peace River region and Siberia, strawberries are produced without added protection and I assume you can do the same in this area. Asparagus is another crop which can be grown in many areas of the north. New cultivars from Washington State are much more uniform than previous cultivars but I believe the real answer is to select superior plants in the north and multiply these by tissue culture.

Many small fruits, including raspberries and the more exotic lingenberry grow wild even inside the Arctic circle. Some of these could be developed as crops similar to the program for saskatoons in Alberta. Crabapples and apples are also long term possibilities. Selections made at the University of Alberta and Beaverlodge have much greater hardiness and more consistent production than previously available cultivars.

I have talked mainly about altering the climate to suit the plant but in the long run, production will be more efficient if the plant was adapted to the environment. Most cultivars used today were developed for more southerly regions and the continued breeding for these climates has probably bred out some of the characteristics needed in the north. 'Contender' bean is an example which did quite well in the Peace. However, the 'improved' cultivars are inferior producers in the north.

This has been a very brief outline of procedures we have used successfully.

More details are contained in the literature listed below.

To summarize, most vegetables and small fruits can be grown in many parts of the north. To be successful with some crops it is often necessary to moderate the climate by using shelter belts, mulches, plastic shelters, irrigation, ridging or terracing. Methods to moderate the climate can be put to immediate use but in the long term, cultivars need to be developed for the north.

(Thank you)

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GUEST SPEAKER: **Hon. Ken McMaster**

Minister,
Dept. of Labour and Manpower,
Province of Manitoba.

(at the barbecue on Thursday evening, Dept. 4)

Impromptu - regrettably not recorded.

"FISH"

MODERATOR, Dale Stewart, Deputy Minister of Northern Affairs:

> One of the major food sources throughout the world is fish; it's an important food source, whether for a primitive civilization or a well developed one as we see in North America. The harvest of this resource probably spawns as much debate as any other natural resource. Our four panelists looking at fish are Worth Hayden, John Bodner, Stu Law and Burton Ayles. Your first panelist, Worth Hayden, is Director of Fisheries with Natural Resources, Manitoba. His background following graduation as a biologist includes trout farming, extension and a session as a consultant. He is a competent, good looking, young biologist.

Worth Hayden, Director of Fisheries, Dept. of Natural Resources, Province of Manitoba, speaking on:

"INVENTORY"

Thank you very much for the flattery, Dale. I will be speaking about the fish inventory presently available in northern Manitoba waters and how they are now being used. I'd also like to preface what I say with a couple of credits - much of the information I will use was not derived by myself. The information on fish potential was work done by an employee of the Fisheries Branch, Art Dirksen, and much of the information on how fish are presently used in a commercial sense by Fisheries Branch employee Eddie Johanson, who for years has done a capable job of keeping track of that sort of thing for us. First, I'll talk about fish habitat.

Northern Manitoba, including the area to the east of Lake Winnipeg, contains more than 50,000 lakes which cover about 27,000 square miles or more than 17 million acres.

Although it is not surprising, it is worthy of note that the vast majority of the lakes are an average of 200 acres in size - a point we will be discussing later.

These lakes cover about 27,000 square miles, or more than 17 million acres. In the first size category are lakes Cormorant, God's Lake, South Indian, with an average size of about 30,000 acres - 162 of those lakes total 4 1/2 million acres. In the next size - 7500 acres, are Clearwater, Bracken, Kiskanu Lakes, 265 of those for about 2 million acres. The next, about 1800 acres are Knife Lake and Landry Lake, 534 of those for about 1 million acres. There are 200 unnamed lakes for 51,000 acres; in total we have 17 1/2 million acres of water.

Not all of these lakes produce or grow fish at the same rate. Generally speaking lakes enriched with nutrients are more productive than lakes with very pure water. Temperature also influences the productivity of a lake since fish and their food organisms are cold-blooded and grow more slowly in cold water. Water temperature is influenced by both lake depth and latitude.

We divide the province into general zones - the North Central Zone, which has a northern boundary, then down the east side of Lake Winnipeg; then the extreme northern zone which is basically north of the treeline. In the North Central Zone, it comes out that these waters can produce between 3-5 pounds of fish per acre. There is a great deal of variation on that, some lakes will produce more, some less. In the far north zone the lakes can produce about 2-3 pounds per acre, because of lower temperatures and lower nutrient levels.

The effects of nutrient level and lake depths can be expressed mathematically to give an estimate of how many pounds of fish can grow in an area of water. This formula is called the morpho-edaphic or Ryder index, and has been proved to be quite accurate. It has been applied to many lakes in northern Manitoba and averaged by regions to show how many fish can grow in an acre of water. These estimates are multiplied by the acres of water in these regions to derive an estimate of the pounds of fish potentially available. In total this estimate is 70.0 million pounds of fish/year.

Approximately half of this total would be from lakes that average 200 acres in size, some of which are too shallow to support fish populations, so a percentage of this potential must be discounted.

Further because northern lakes 200 acres in size are likely not suitable for landing a float plane and are thus inaccessible, from a practical standpoint all fish potential from these lakes can be discounted. Finally, it has been found that half of the fish available in a lake are low-value or coarse fish. As a result of all these factors estimates of fish realistically available in northern lakes are: 32.2 million pounds of all large fish species - 16.1 million pounds of these being high-value species per year.

Based on the history of catches in the commercial fisheries of northern Manitoba the 16.1 million pounds of high-value species would be represented by the harvested fish species as follows: 9.0 million pounds of whitefish, 3.5 million pounds of walleye (pickerel). 2.4 million pounds of pike, 0.6 million pounds of lake trout, and 0.6 million pounds of other high-value species.

Manitoba is also coastal to Hudson Bay from which other fish might be harvested. Species of primary consideration here are the marine capelin, Greenland cod and the Arctic char. Hudson Bay is mildy saline, not as salty as the Atlantic Ocean, and thus not suitable for freshwater fish, it is so low in nutrients as to be much less productive than other marine waters. Capelin and Greenland cod are thus low in abundance. Arctic char are limited to a very few of Manitoba's coastal rivers, e.g. Seal River and Churchill River, where some sport fishing occurs. Now what I would like to talk about is what and how much is actually being harvested, then compare this with the potential.

Fish in the north are harvested either commercially, domestically or by sport fishermen. In Manitoba the greatest volume is harvested by commercial fishermen but the greatest value per pound is realized on the domestic or sport fisheries.

Commercial fishing in the north has been going on since the early 1900's, when it was centered on lakes around The Pas.
In the mid 50's there was a marked increase in the number of fisheries, a change that was probably related to improved transportation in the north.

With improved refrigeration and transportation facilities, by 1965 the number of summer fisheries exceeded the number of winter fisheries. The increase in commercial activity since 1975 is related, at least in part, to fish prices. Last year there were 122 summer fisheries and 62 winter fisheries in northern Manitoba.

These fisheries presently provide income and employment for about 900 fishermen in summer and about 250 in winter.

During 1979/80 these fisheries produced 3.8 million pounds of whitefish, 1.6 million pounds of walleye (pickerel), 1.4 million pounds of pike, 63,000 pounds of lake trout, and 1.1 million pounds of the others for a total of 7.9 million pounds. Approximately 6.9 million pounds of this was high-value fish. The "others" were predominantly tullibee and suckers. Harvest of these lower-value species had doubled in each of the past two years because of the higher prices being paid for these fish.

Domestic Fishing: Subsistence fishing or fishing for food is a very important fish use, especially in native and remote communities around which this fishing is done. The amount of fish taken in the domestic fishery is difficult to estimate, but surveys of domestic harvest have been conducted in a number of northern communities in an attempt to establish the importance and size of this fishery. Although estimates vary considerably between communities, an average figure of 50 lbs/person/year is thought to be a reasonable, albeit conservative, estimate. Since the fishing is done primarily by native people, census figures of 20,000 native people in northern Manitoba times 50 lbs/person/year give what should be considered a minimum estimate of 1.0 million pounds of fish harvested each year by domestic fishing.

Sport Fishing: This segment of the fish harvest industry has expanded greatly in recent years with the development of new lodges and outcamps, and with new roads making more and more areas accessible. Sport fishermen are very selective in their harvest, pursuing pickerel, pike, lake trout, and to a lesser extent the limited brook trout, grayling and Arctic char of northern waters.

Put all this together, these estimates of how much fish per acre can be produced, multiply by the number of acres of water, and we come up with an estimate of the potential of fish available.

For Northern Manitoba we come up with an estimate of 70,000,000 pounds of fish per year being grown. From this point on we whittle it down to a more realistic figure. Half that total would be from lakes that are less than 200 acres in size, some are too shallow to support a fish population, some are not suitable for harvest - too small to land a float plane on, or don't have a road into them. So we discount all the production from the small lakes. It works out that there's a fish harvest potential of 32.2 million pounds. Further from that, about half the fish available in a lake are coarse fish, sucker or tullibee. Commercial sports species - about 16.1 million pounds available there.

Of those high value fish, 9 million pounds would be whitefish, 3 1/2 million walleye or pickerel, 2.4 million pounds pike, .6 million pounds lake trout and .6 million pounds other high value species.

(Thank you)

"FISH"

MODERATOR, Dale Stewart, Deputy Minister, Northern Affairs:

John Bodner is well known to most Manitobans, with interests ranging from air service to ice cream parlours, and some he doesn't talk about. He is involved with the Chamber of Commerce, and is now reeve of the LGD of Consul.

John Bodner, Former Manager Co-op Fisheries Ltd., The Pas, Manitoba, speaking on:

"COMMERCIAL"

Mr. Moderator, ladies and gentlemen, fellow panelists: First I want to express my observation of Northern Manitoba and its lakes and streams which I found the most striking feature of the area north of the 53rd parallel, I've lived and travelled here since 1939. They vary considerably in size from 300-500 square miles.

The smaller lakes occupy the hollows or the lowlands. The larger ones are commonly in the water basins of the Churchill, Saskatchewan, Nelson, Grassy Rivers and a number of other rivers creating one of the important industries for approximately seventy thousand citizens of Northern Manitoba that are scattered over ten thousand square miles of water in two cities, six towns and twenty unincorporated villages.

These unincorporated villages represent approximately 17 1/2% of the total population in Northern Manitoba and it is in this area that the future programming must concentrate on maintaining and sustaining fish food production, not only for the seventy thousand citizens living in northern Manitoba, but also for people living in other areas where fish supplies are few and do not fill the demands. In the fishing industry we cannot, with certainty, predict the volume for next year's production or make a positive identification by species needed.

But, we can predict, with given probability, that by providing the information needed to the fisherman producer towards joint decision making, we can determine the best trade-off between fishermen's risks and returns in harvesting for local or provincial sales.

There is a gamble in producing species that will be in high demand by the public and in order for the fisherman to obtain the highest possible earnings, he must have a clear idea of what species to catch seasonably.

The history of commercial fish production is easy to trace with accuracy. Winter fishing gives the fisherman more advantage and higher earnings as there is less fish from other areas at that time. Similarily, it is desired to limit the probability that the harvest is less than the limit of catches set out by the province, therefore, let the harvest set the amount for future harvesting.

Just to give you some idea, if one man is an expert fisherman, and another an expert boatman, the two together will catch twice as many fish as one working alone. This principle in specialization is important when one seeks to earn his living.

The fishery statistics clearly indicate the differential by species and by regions - the valleys and the peaks in production. As an example, the waters of Moose Lake are unproductive with the use of conventional gill nets nine months out of twelve. In the three month production period, the pickerel and jackfish peak in the fall of the year. This situation exists in many other fishing waters located on the rivers water sheds. These areas therefore cannot be considered as an all year round producer of establishing plants for the crying need of reducing waste from the edible portions at the source of production, to supply a continuing source of whole fish for processing for local and existing provincial or export markets.

Another example of a similar situation was described in a report by C.A. Milko - Departmental Fisheries Specialist with Indian Affairs - on the Lac Brochet fishery operation. This operation prevails an entirely different problem from Moose Lake.

The area is not economically viable to produce commercially whole fish for distant markets or capable of producing large quantities of fish that would be acceptable by the consumers in processed products that would make this operation a processing establishment at the source of production. Milko's report of the operating problems very ably describes the situations as follows:

Transportation	85% of delivered price
U.I.C.	1% of delivered price
Receiving station expense	2% of delivered price
Credit corporation repayment loans	2% of delivered price
Gasoline used in fishing	24% of delivered price
	114%

These expenses suggest that the 85% of transportation costs or 39 1/2¢ per pound on whole fish, when reduced to 50% on separating the waste from edible portion, the transportation costs double from whole fish to the edible portion of 79¢ per pound that must be absorbed by the consumer.

When I say edible portions, let's take walleye pickerel, everybody's favourite - only 43% of the fish we catch is what you people buy in the store. The rest, the head, skin, uiscera, is waste. We have pickerel lakes which will show 46% recovery, smaller heads, better feed. This is what you pay for.

What then is the future of the Freshwater Fishing Industry in the producing areas that are only accessible by air, costing the producers approximately $790.00 per ton from source of production to the source of processing, in some cases exceeding the fisherman's sales. I cannot think any other food commodity that could compare cost wise for our daily food products.

This situation plus quality controls on packaged fresh fish products requires processing plants. These should be established at or near the point of production on the lake.

The Manitoba Government fishermen's transportation assistance which does not fully cover the transportation costs, does provide some additional help for the fisherman. If this assistance, plus a minimal increase, can be assured, it would make it one step closer in expanding the fishery operation, both in production and processing in the central areas of northern Manitoba. It would reverse the present situation to one that would lower the costs of transportation on many of the fishing waters that are presently idle; also create job opportunities in processing and job training for future expansion in fish processing on smaller scale or production levels.

This will apply, particularly to Lac Brochet where the situation is still being subsidized on high quality fish.

Generally speaking, processing plants are located at the source of production where acceptable quality waters are available, and a steady supply of labour. It is most important that a steady supply of raw materials be available here.

In the northern area with a potential of approximately 10 to 12 million pounds annually there is utilization of twelve species of fish, being Whitefish, Tulibees, Trout, Suckers, Sturgeons, Sauger, Pike, Perch, Mooneyes, Maria, Goldeyes and Pickerel.

The present annual quota of approximately seven million pounds, on 360 lakes, has not been achieved. The average annual fish harvests, spread over a period of eight years, was approximately 3.7 million pounds or 53.5% of the lake quotas including the sucker production which is not usually recorded against the prescribed limits. The failure to harvest the quota appears to be two-fold.

1. Insufficient volume on the allowable commercial fishing waters to establish lake shore facilities for handling and storing of fish in preparation for sufficient volumes for loading aircraft.

2. The aircraft and processing of fish to meet the consumer demands are chiefly responsible for the predominance of summer fishing as opposed to winter, that used to produce approximately 3.5 million pounds, instead of 600 thousand for each winter season in the past few years.

This situation has reduced the Northern Manitoba production from an all time high of 10.2 million to 6.1 million or less, depending how you apply the total mullet production to the annual total.

Significantly, the most popular species harvested with gill nets remain almost in the same abundance as during the higher period of production.

With the increase in the Northern Manitoba population, together with additional increase expected in the very near future on new resource development, some marketing authority is required to report for the regional and provincial consumer demands. The long overdue emphasis that is to be placed on fish marketing in the Province of Manitoba, and let it be remembered that marketing locally or provincially starts when the catch is delivered.

The consumer can do with less distant fish delivered after many days in ice. Quality will sell.

However, there is another consumer neglect of fish consumption, partly due to massive advertising on television and other media of competing protein food commodities, often enjoying a much heavier government subsidy.

Expenditures on advertising fish is negligible. Pleasing or not, it has to be recognized that the Federal Government fish inspection service have built in requirements for good quality of fish. The traditional retail marketing is inadequate to perform sales service to the consumer due to their lack of perception in handling, storing and show case facilities. The fact is that only fish whole or processed with maximum eye appeal, cannot only hold, but will increase daily sales.

In order to achieve this goal the retail trade stores must modernize their facilities with refrigerated fish display counters for the housewife to buy her fish requirements in modern, attractive surroundings with specially designed refrigerated units to preserve the quality and should be kept exclusively for fish displays only. Only then will the fishing industry, as a whole, re-examine their present methods of distribution of sales and agree upon reorganization.

There will be tough times requiring progressive thinking and the backing of enlightened and vigorous authority engaged for this purpose.

This seminar on local fish marketing, sponsored by Norman Region Development Corporation could well be the beginning toward changing the attitude of the consumer and it is hoped, that once started, a whole new local market will be completely developed not only for the northern products, feeding the northern people, but also to include other areas. We must realize that the consumer's attitude will largely depend on the changes that will also be required from the Federal and

Provincial regulations, Fishermen on the lake operations and handling and processing preparations.

I think most of us who have been involved in the fishing industry must admit, the problem has always been with us that production gets all the attention and marketing gets the wishful thinking.

We do spend large sums of money on lake shore installations, fishing equipment with plans that are all important in fish production. We hire the best possible men we can find, we religiously examine our fishing waters for good quality fish, to make sure we get as much as we can, as good as we can and as cheaply as we can We concentrate our cash, our thinking, toward producing more fish at lower costs and this is all good, but if each one of us considered how much time during the production periods was spent on local and provincial markets we would find that not enough was done. I believe that one of the major problems is unsuccessfully marketing of fish under the banner of "North Feeding the North" would only be successful provided the total fishing industry co-operated in recognizing the importance of this local marketing.

Frankly, most of us do not bother giving local marketing at the production level enough attention to expect a good job. For example, in the past year, the total commercial fish sales in the Province of Manitoba were 571 thousand pounds or 1 3/4 pounds per capita which is far below the national average or in comparison to 45 pounds per capita that was recently estimated to be consumed by approximately 24 thousand people of Indian ancestry living in northern Manitoba. If facilities were equally adequate the per capita consumption on commercial sales would be much higher for all people living in the more northern part of the province.

In one of the statements made by Paul Rennick, panelist for land and water, he described the commercial potential for fish in northern waters at the present time as vastly underutilized. He confirmed a statement made sometime ago by a very able director of Manitoba Fisheries and I quote "The surface of some 25 million acres of Manitoba waters and streams covers one of Manitoba's most valuable resources of a potential food protein crop of one hundred million pounds of fish that could be harvested annually, only a small portion is being utilized".

What are some of the problems?

In summary, it can be said that the whole problem would be at least partly solved if the following points were implemented:

1. Further reductions on transportation costs be implemented by changing the present government subsidy policy, by pro-rating the actual cost of transportation from fishing waters to the point of processing and distribution for local sales.

2. Federal, Provincial financial assistance toward advertising and promoting greater consumption of locally produced, and marketing. and to include the new product developed from rough fish, by Federal Department of Fisheries.

3. To stimulate the local fish production and sales from small lakes having not been fished for many years due to small limits, the provincial government fishing regulations be changed from seasonal licence to a long-term lease in order to justify the investment into lake shore facilities.
4. It is imperative that some considerations be given to re-opening lakes now closed to commercial fishery in favor of sport fishing in the immediate vicinity of northern Manitoba's population centres for multi purpose use: namely, the availability of fish for local sales, the continuation of sport fishing and the beginning of research requires:

    a) the effects of this change on future supply for sport fishing quantity and quality;
    b) what the incomes of sport fishing is to the northern economy of Manitoba;
    c) what volumes are removed annually and what use is made of the sport fishing catches.

A man was fishing in a stream when a fellow came by and asked him how he was doing. "Fine, he said. "Oh, what have you caught? "Nothing I haven't had a bite in three hours" "And you call that fine?" "Well, do you see that man over there? He hasn't had a bite in six hours!"

With that I will say thank you.

"FISH"

MODERATOR, Dale Stewart, Deputy Minister, Northern Affairs, introducing

Stu Law, Director Fisheries and Freshwater Institute, speaking on:

"PROCESSING"

Mr. Moderator, fellow panelists, ladies and gentlemen:

I welcome this opportunity to participate in this discussion of the potential for utilizing the fishery resources of the north and particularly northern Manitoba. I do feel a bit intimidated when I look at the quality of the rest of the panelists and particularly JOHN BODNER, with his long experience in the Northern Fishery.

I was asked to direct my remarks to two particular areas of the fishery,

A) What limitations on the utilization of northern Manitoba's resources exist because of environmental and biological contaminants, and

B) What further processing opportunities exist for northern fish production.

A. CONTAMINANTS

The environmental contaminants that limit the safety of fish for consumption and consequently have been identified to date as PCB'S, Dieldrin, Mirex, DDT, Arsenic and Mercury. The monitoring and survey work done on fish in Manitoba and in fact all northern freshwater fish has identified a problem with only one of these contaminants, mercury and then only in a few areas and for specific species.

THE COMMERCIAL FISHERY

It is the policy of the Federal Department of Fisheries and Oceans to permit the export of fish to any country providing the level of mercury in the fish does not exceed that permitted by the importing country, This is important because different countries have established different permitted levels.

E.G. - Canada - 0.5 PPM Maximum

France - 0.7 PPM Maximum

U.S.A. - 1.0 PPM Maximum

Using this criteria, seven lakes in northern Manitoba have mercury levels in northern pike too high to market commercially, and four lakes have mercury levels too high in pickerel to market. No commercially fished lakes in northern Canada have mercury levels in whitefish that exceed permitted tolerances.

THE DOMESTIC FISHERY

Fish, in addition to its commercial importance is an important source of food for local inhabitants in Northern Manitoba. A tri-partite committee representing Provincial Agencies, National Health and Welfare, Fisheries and Oceans, Manitoba Indian Brotherhood and other interest agencies meet on a routine basis to review mercury levels in fish and identify local communities that may be at risk because of high fish consumption. The medical service branch of Health and Welfare will then monitor those communities to ensure elevated mercury levels are not occurring in the local inhabitants.

In summation, while mercury levels in fish in Northern Manitoba lakes cause problems for regulatory agencies, the Freshwater Fish Marketing Corporation, some commercial and domestic fishermen, it is not at this time a serious constraint to the commercial exploitation of the fishery, except in certain isolated lakes or systems such as the Rat-Burntwood.

BIOLOGICAL CONTAMINANTS

A parasite in whitefish Trianphorus Crassus is a serious constraint to the marketability of that species. It is not harmful to humans, but it forms cysts in the flesh of the whitefish and in large numbers is aesthetically offensive. The United States Food and Drug administration has established a maximum tolerance for whole whitefish and fillets of 50 cysts/hundred pounds, and the Canadian Inspection Branch 80 cysts/hundred pounds for sale in Canada. All shipments to the U.S. must be certified by an inspection officer of Fisheries and Oceans that the shipment meets the U.S. tolerance. Because of this, all lakes fished commercially for whitefish are classified as to their suitability for export and whitefish from the lakes priced accordingly.

To give you an understanding of the extent of this problem, and how it affects northern Manitoba fishermen, we need only look at the following production figures.

Total production whitefish in Manitoba

		TOTAL POUNDS PRODUCED	PRICE/LB. 80/81
Export	-	2,443,252	.48¢
Continental	-	1,534,871	.31¢
Cutter	-	1,144,253	.20¢

The fisherman is paid less than half the price per pound for highly infested whitefish.

Over the year much research has gone into trying to eliminate this parasite by breaking its life cycle, without any practical success. The fisheries development group at the Freshwater Institute is working with the Food Science Department of The Univeristy of Manitoba to see if flesh from contaminated whitefish and tulibee can be further processed into "SURMI" a product used by the Japanese to manufacture fish sausage. If successfuly, this will hopefully result in increased landed values for infested Whitefish.

In speaking about opportunities for further processing, and northern fish production:

The Freshwater Fish Marketing Corporation in Transcona is a Federal Crown Corporation that by legislation has the sole right to market fish and fish products from the three prairie provinces and the N.W.T., and therefore has the major influence on the processing of fish in the North. I will therefore direct my remarks to some of those activities which the Fisheries Development Group and The Freshwater Institute are involved in to utilize new species and better utilize species currently being exploited.

WHITEFISH ROE -

This product was first produced four years ago in small quantities (A few hundred pounds) and sold to the Japanese. It has since been expanded into the European and North American markets. A total of 12 metric tons were produced from across the region last year. It was collected in Great Slave Lake, N.W.T., and Lac La Biche, Alberta, Lac La Ronge and Diefenbaker Lake in Saskatchewan, and Waboden, Berens River, The Pas and Leaf Rapids in Manitoba. The price to the fisherman was $1.25 per pound and represented approximately a 35% added value to participating fishermen. The product in North America is being actively marketed as "Whitefish Golden Caviare". The prospect for this product I believe is exciting. Some was available at the barbecue last night; I noticed it there.

The fresh market for fish is strongest in the winter months and winter production is being encouraged by PPMC through a price incentive of approximately .15¢ per pound. However, winter fishing is a cold, back-breaking job out on the lakes. A mechanized winter fishing rig with shelter and mechanical net puller has been developed and is undergoing trials in Northern Manitoba and on Great Slave Lake. It is anticipated this unit will increase the efficiency of winter fishing and permit fishing in inclement weather.

In underutilized species, there are tremendous stocks of mullet available to be exported if markets can be found. Current production goes mostly for pet food. Work continues to be done on the development of deboned mullet for the institutional market and the "Gelfiltefish" Industry.

Offal waste from fish plants currently has no use and in fact constitutes an environmental hazard and creates disposal problems. A fisheries development project is currently being funded by the Department of Fisheries and Oceans in Alberta to process these fish wastes into a form where they can be utilized as a feed suppliment. The Alberta Department of Agriculture will be conducting feeding tests with this material during the winter, and hopefully, this will prove to be another valuable by-product of the fishing industry. Pulse fishing is a management strategy which permits heavy fishing for one season followed by a period of time when no fishing is allowed until the stocks recover. This has application on the smaller northern lakes where the quotas are small and uneconomical to fish on a season to season basis. A preliminary trial was run at Mackerracher Lake in 1977 in which fly-in equipment was developed and proved satisfactory for remote lake operation. A shared program with a province to prove the biological feasibility of this procedure is now required.

A mobile fish processing plant has operated over the past 3 years: Two 52 foot trailers that are completely self contained, holding ice machine, power unit, and showroom, at Diefenbaker Lake, Beaver Lake, and Ochombeau Lake in Saskatchewan. It has been moved a total distance of 7000 kilometres in this period of time. The mobile feature permits this facility wherever there is road access. One of the major constraints is transportation of fish out of the north. Technology is being developed for modified atmosphere and bulb containers to extend the shelf life of fresh fish, moving it to market. This is an area that has to be very closely looked at in the future.

I hope my presentation has given you some food for thought on the opportunities for commercial fishing in the North. Technological, regulatory and marketing problems exist that are being worked on and the long term future, in my opinion, for the commercial fishing industry in the North is bright.

(Thank you)

"FISH"

MODERATOR, Dale Stewart, Deputy Minister Northern Affairs, introducing

Burton Ayles, Freshwater Institute, Fisheries and Oceans, Canada, Winnipeg, Manitoba, speaking on:

"HATCHING AND FARMING"

I'm from the Freshwater Institute, not the Freshwater Fish Institute. Dale also asked me to explain what "aquiculture" is. Aquiculture is to commercial fishing as beef cattle raising is to hunting moose, I suppose. With cattle ranching we have all kinds of intensities of production, free range to improve pasture, and improve feed lot operations. The same applies for aquiculture. There are three or four different types of fish farming, different degrees of intensity. For years it's been possible to freeze and store bull semen and hold for later artificial insemination; this is now possible with rainbow trout.

Fish is a very important component of the diets of northern residents. The average Canadian consumes only 7.5 kg (16.3 lb) of fish annually, but in Aklavik, Northwest Territories, the average consumption for a family of 5-6 is over 272 kg (600 lb) per year (Jessop et al. 1974). In Cross Lake, Manitoba, it would cost $460 (in 1972) to replace the domestically caught fish in a typical (7 persons) family's diet with food from the local store equivalent of $3.08 per person per day or 60% of the total value of domestic food production for native groups in the Churchill River basin of northern Saskatchewan (Aski-Puko - The Land Alone, 1976).

The productivity of freshwater environments in the north is very low in comparison with lakes in southern Canada. Because of this low productivity, fish stocks in the north are very subject to depletion by over-exploitation, pollution and other environmental disturbances such as hydro dams. Although the total biomass of fish in the north remains high, certain populations very important to local communities have been severely reduced in size.

For example, the Sylvia Grinnell River at Frobisher Bay commercial fishery produced over 10,000 kg (22,000 lb) annually during the late 1950s and early 1960s.

Because of heavy exploitation catches fell in the late 1960s and the commercial fishery was closed. Continued sport and domestic fishing has kept the population low and the Sylvia Grinnell is still closed to commercial fishing (Kristofferson, personal communication). Increased development in the north will put even greater stress on fish stocks, leading to further depletion and increased food costs for local residents.

There are a number of different ways in which availability of fish on a year-round basis can be assured. In this paper I outline a number of means by which we could improve fish production by better utilization of what is now available and by artificial techniques or aquiculture. The techniques discussed have all been researched and developed in more temperate climates. Additional research may be necessary to extend their applicability to the north. Ultimately their suitability will depend on economic considerations.

There is little doubt that more fish could be taken in the north if production and transportation costs were not so high and the value of the product so low. This may change in the future as development proceeds, making more areas accessible, and as world protein prices increase. Before enhancement and aquiculture development becomes widely practiced, harvesting of presently underexploited stocks and implementation of different management strategies will bring additional benefits to the north.

A 1972 Federal-Territorial Task Force on fisheries development (Where to Now? 1972) in the Northwest Territories identified the following as areas having potential for commercial and recreational development:

1. Great Slave Lake (sport and commercial)

2. Road-access lakes around Great Slave Lake (sport)

3. Char fisheries in rivers flowing into Coronation and Queen Maude gulfs and Rasmussen basin (sport and commercial)

4. Great Bear Lake (sport)

5. Rankin Inlet (commercial)

6. The Mackenzie Delta (commercial)

7. Camsell River (sport and commercial)

8. Keewatin Lakes (sport and commercial)

9. Baffin Island Coast (sport)

In northern Saskatchewan there is little opportunity for harvesting unexploited stocks (A. Murray, personal communication). There are only 113 lakes over 50 km^2 (19.5 mi^2) in area and all have commercial fishing. The same also holds true for northern Alberta and northern Manitoba. Virtually all economic fisheries in the prairies are presently being fished. Substantial new production will depend on utilization of species that are presently of low value and thus will depend on new or improved markets. It is likely that in the future there will be increased competition between sport and commercial fishermen.

Traditional management tools such as licensing, quotas, mesh size, fishing seasons, etc. often offer the opportunity to provide more fish, particularly if the resource user and the resource manager recognizes the need to cooperate in their establishment and enforcement.

Rotational or pulse fishing is a management tool which may be advantageous in many areas. With this method the equivalent of several years' harvest is taken in a single year and then the lake is allowed to lie fallow for several years. The fixed costs of setting up a fishing operation are spread over a larger volume of fish, improving the economics of the operation. This practice is used in several lakes in the Northwest Territories and is being applied on a test basis on a char run in Cambridge Bay (R. Mosehnko, personal communication). It has also been tried as a pilot operation in northern Manitoba.

Changed management procedures such as reductions in quotas or increases in mesh sizes may allow some depleted stocks to recover but this is not always the case. In some areas of the north exploitation, destruction of spawning and rearing habitat, and other man-made stresses such as hydro dams have led to the almost complete loss of some stocks of fish. Enhancement or the hatching, rearing and release of young fish and rehabilitation of habitat in conjunction with modified management procedures may be necessary on a continuing basis.

In Peter Pond Lake in the White Swan lakes in northern Saskatchewan whitefish fry (Peter Pond) and lake trout fingerlings (White Swan lakes) are being stocked to replenish exploited populations. Hatching and rearing ponds are also being considered for La Ronge to serve other lakes in the north (A. Murray, personal communication).

The Manitoba Department of Natural Resources operates a large fish hatchery at Grand Rapids producing walleye, whitefish and several different species of trout. Whitefish spawn is taken from fish in William Lake near Grand Rapids and stocked into William and Moose lakes for commercial fisheries. Walleye spawn is taken in Limestone Bay and walleye fry stocked back into the north end of Lake Winnipeg. Approximately 2 million lake trout eggs are taken from Clearwater Lake at The Pas for stocking throughout the Province. For sport fishermen the Department stocked 108,500 lake trout, brook trout, rainbow trout and splake in 7 lakes around Thompson and 7 lakes around The Pas (R. Thomas, personal communication).

Recent investigations by biologists from the Manitoba Department of Natural Resources and the federal Freshwater Institute (Department of Fisheries and Oceans) are leading to new methods of enhancement of walleye and whitefish stocks. Adult fish are spawned artificially and the fertilized eggs are incubated in a hatchery. When the young fry hatch, rather than being released directly into the lake, as is normally done, the fry are stocked into large rearing ponds. In the rearing ponds there is abundant food and young fish are protected from predators and other stresses, so they grow fast and relatively small numbers of them die. In the fall the young fish, now 10-15 g (1/3-1/2 oz) in size and much more able to avoid danger, are released into the lake.

In 3-4 years the fish can be caught and in a few years, with new management procedures, a self-sustaining population may be established. This type of enhancement will be suitable in large lakes where fish stocks have been damaged by exploitation and habitat destruction. Commercial fishermen will receive the greatest benefits but sport and domestic fishermen will also participate.

Lake fertilization is another enhancement tool which may be useful in parts of the north. Low productivity of Arctic char in many systems seems to be affected by the low productivity of the freshwater lakes where young char spend the entire year (Johnson 1980). Growth and productivity is much greater when the char are finally big enough to migrate to the ocean for summer feeding. On the Pacific coast fertilization of some lakes has increased juvenile salmon growth and survival by increasing the food supply (Stockner 1979). In the north lakes producing Arctic char could be fertilized with artificial fertilizer or, if close to a community, by treated domestic sewage.

The results of habitat rehabilitation may not be so dramatic as enhancement projects but they can be just as effective. In many cases habitat rehabilitation may be very straightforward. For example, along the Hudson Bay coast access from the ocean into many small char streams is restricted in many years by low flows. Simple manual clearing of boulders and channelizing the streams would make more wintering lakes available for the char. Road construction in the north has destroyed or restricted access to spawning grounds. Proper design during construction would prevent such problems. Habitat rehabilitation in areas where there have been major disturbances such as hydro dams may be more involved. Clearing of trees along streams, removal of sediment from spawning beds and dumping of gravel to create new spawning areas are only some of the procedures that may be necessary.

Lake culture of salmonids has become well established in small lakes in the prairies (Ayles 1977) and is practical in some areas of the north. Fingerling (6 g) trout are stocked in small lakes shortly after ice-out in spring and harvested as pan-size fish in the fall. The lakes have no native fish and are rich in food so survival is high and growth is excellent even without artificial feeding.

The majority of stockings in the prairies have been by private fish farmers interested in producing food. In 1976, 4,000 farmers harvested approximately 700,000 fish (200,000 kg) (Ayles and Brett 1978), most of which was consumed at the dining tables of farmers or their friends and neighbors.

In northern Canada there have been lake stockings for sport fishing done in the Yukon (Kendel 1973; Walker et al. 1973) and in the Hay River, Northwest Territories, area (Papst et al. 1980). Near The Pas, Manitoba highway borrow pits have been stocked with trout for anglers with considerable success (Sunde 1961; Schlick 1967).

In northern Manitoba there are a few lakes that are suitable for commercial lake culture. Large numbers of fish have been produced for several years from Footprint Lake near Grand Rapids and recently fish have been marketed from lakes around The Pas and Thompson. The environmental requirements for lake culture in the north are: no inlet or outlet streams to lake; mean depth less than about 3 m (10 ft); abundant natural food; no native fish species; at least 200 ha (494 acres) in area (big enough to produce 10,000 kg annually (22,000 lb) at 50 kg/ha (44.5 lb/acre); good road access; and an ice-free season from the first week of May to the second week in October.

Since the planted fish are privately owned, individual operators rather than regular fishermen would take part in lake culture.

In many areas of the world fish are confined in large cages and grown for market. Such a system may be suitable in certain area of the north where there is an inexpensive supply of food to feed the fish and a good water source.

The Freshwater Institute carried out a rainbow trout cage culture feasibility study in Heming Lake north of The Pas, Manitoba, between 1972 and 1974 (Whitaker and Martin 1974). The most successful design was a floating wooden dock anchored in 6 m of water with a 6.1 m x 6.1 m x 4.6 m (20' x 20' x 15') cage of flexible nylon mesh. Large (13.9 g) fingerlings proved adequate. They were reared for 130 days and fed artificial pelleted food every two hours. At harvest they had reached a marketable size of about 200 g (7 oz). With this system harvesting the fish is much easier than with lake culture, survival is greater because the fish are protected from predators and can be treated if diseased, and production per unit area can be much higher. On the other hand, costs are higher because cages must be constructed and the fish must be looked after and fed daily.

Normally pelleted manufactured diets are used for trout cage culture but the successful cage culture operations in Norway depend on the large volume of low-value trash fish produced by the commercial fishing industry (Edwards 1978). Great Slave Lake produces large numbers of mullet and burbot which are discarded by fishermen on the lake. This resource could support a cage culture operation at Hay River or one of the nearby smaller lakes. In Saskatchewan, Lac la Ronge could also support such an operation and in Manitoba there are areas of South Indian Lake, Cedar Lake and the Nelson River near Norway House that appear suitable.

The environmental requirements for cage culture in the north are: a small lake with good wind exposure or a large slow-flowing river; a substantial area of water over 6 m deep (20'); good water circulation; an ice-free season of over 150 days; good road access; and a supply of trash fish from a commercial fishery.

An alternative type of aquiculture called "ecological aquiculture" may also be suitable in some areas of the north. These aquiculture systems are designed to conserve energy, make maximum use of renewable energies, recycle nutrients, employ a diversity of species and subsystems and often link aquiculture and agriculture (MacKay and Ayles 1980). work on ecological aquiculture is being carried out by a number of groups including The Ark Project in Prince Edward Island[1] (van Toever and MacKay 1980).

In The Ark project fish are grown in a greenhouse in conjunction with a variety of vegetables and flowering plants. The system consists of a 1400 L (308 gal) fish tank connected to a 600 L (132 gal) biological filtration tank. Waste water from the fish tank is pumped through the filtration tank and then back to the fish. Additional water is added only when the settling chamber in the filtration tank is cleaned out. In test runs rainbow trout, tilapia and brook trout have been grown in the fish tank. Watercress, comfrey, lettuce, tomatoes and pea seedlings have been grown on the filter tank gravel on styrofoam blocks floating in the fish tank.

Ecological aquiculture systems are still in the developmentaL stage, and production remains low. In the future, modifications of such systems may be found in homes and small greenhouses in many areas of the country; particularly in areas such as the north where transportation costs from major producing areas are high. These types of units will probably be operated by individual households rather than by large industries.

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[1] The Ark Project, Institute of Man and Resources, R.R. #4, Souris, Prince Edward Island COA 2BO

Aquatic organisms grow best at certain temperatures. If temperatures are above or below the optimum, growth is markedly slower. Northern waters are too cold for rapid growth for almost the entire year and for some warm-water species the low winter temperatures are lethal. Controlling water temperature and other environmental factors such as light, feeding rate and water quality will permit the rapid production of fish, even tropical species, all year around. Using what will otherwise be waste heat from some of the large energy-related industrial developments scheduled for the north, such prawn as well as temperate species such as trout and catfish and northern species such as char could be provided fresh daily in some settlements in northern Canada.

Waste heat aquiculture will be biologically and technologically more complex than cage culture or lake culture. A typical northern system might well be associated with a greenhouse operation and located next to an abundant source of waste heat. Fish would be grown in large plastic or fiberglass tanks provided with continuous supplies of heat water. Food would be dispensed automatically to each tank several times a day. The fish would be selectively bred for rapid growth and other characters of commercial importance, and they would be checked frequently for the presence of disease organisms. Small fish would be added to the system several times a year and market-size fish would be harvested at regular intervals.

There may be opportunities for waste heat aquiculture in conjunction with some of the mining and smelting operations in the north or in conjunction with the new LNG (liquified natural gas) terminal planned for Melville Island in the Northwest Territories. The compressor stations on the gas pipe line planned for several areas of western and northern Canada will produce large quantities of high-grade (***350 C) waste heat which could be used for both greenhouse and aquiculture production. For example, the Alaska Highway gas pipeline project (Fig. 1) will require 7 compressor units at 5 sites to move the gas through the Yukin. Each nit will have a waste heat availability of between 76 million BTU/hr and 82 million BTU/hr. This is enough to heat 32,000-34,500 L (5100-5500 gal) by 10 C every minute. Over 65,000 kg (29,500 lb) of trout could be grown in that amount of heated water. There is no doubt that a pipeline compressor station could supply all the waste heat necessary for an aquiculture operation.

Projects must be designed around site-specific parameters such as waste heat availability, water quality and quantity, availability of feeds, availability of markets, capital construction costs, etc. Adaption to each situation is required. The use of site-specific advantages will be the main characteristic of a successful operation.

In the far north exploitation of new stocks of fish holds the greatest promise. In the northern parts of Alberta, Saskatchewan and Manitoba new management techniques will increase economically viable fish production, and in certain areas enhancement and rehabilitation will help return depleted fisheries to previous levels of abundance. Lake culture and cage culture will be restricted to the few areas where environmental conditions are suitable and will produce non-traditional species such as rainbow trout. Ecological aquiculture will be small scale and will not be widespread for many years. Waste heat aquiculture will only be practical in a very few areas and it will be operated in conjunction with a larger industry.

(Thank you)

"MEAT, DAIRY, FORAGE"

MODERATOR, Hon. James Downey, Minister of Agriculture, Province of Manitoba:

George Vercaigner is a producer of hogs from the Brandon area - George is what I would consider a real entrepreneur, not only in hogs, but agriculture in general. He is a thinker, an active man, and a very astute producer. George I'm sure you'll shoot straight from the shoulder, and tell these people in the northern part of the province as it is about hog production.

George Vercaigne, Producer, Brandon, Manitoba, speaking on:

"HOGS

I feel a bit confused here, like the motto I've seen about the clever man who tells his wife he understands her, and the stupid one who tries to prove it.

Mr. Donahoe's private tour yesterday evening provided the occasion for us to see the Pasquia and The Carrot River Valley area, and to receive other sources of information for the production of hogs here north of the 53rd parallel. With that, I re-wrote my script. Having been raised on a small mixed farm in a fertile mountain near the American border, we milked a few cows, farmed with horses, and also had 3 or 4 hogs, usually in a pen in a far corner of the barn. It needed cleaning out once in awhile, and being the oldest in the family, I got that job quite often, not too pleasant, with a fork and over a 6 foot wall. I said: "That's one thing I'll never have on a farm - hogs". But to pay mortgages and to keep food on the table, they really don't smell that bad. A couple of months ago. when they were 40¢, Mr. Downey, they didn!t smell that good either.

When we begin to look at and comprehend the opportunities of livestock and food production for the North feeding the North, the regulations of the program dealing with the marketing board should have no controls whatsoever. Their limitations perhaps curtail you from the production that you would provide.

If you could produce hogs here, you should have your own killing plant, and also have the right to deliver the hogs directly to your own plant, and to be able to process them and sell them here in your local area, or further north. I notice that you have used the product here, having had breakfast here the last couple or three days; the pork products were really great, even though we produced them, I suppose, further south. Another area of marketing board restrictions is in the fish industry and the potato industry. Both products could be used in the production of hogs, and a fish meal plant which is very high on protein, could be another asset to your total package in a balanced hog and poultry program.

Three important elements in the production of hogs are water, food or rations, and buildings. Large farrow operations in the valley here or any other areas where you could grow cereal grains in close proximity would be a great advantage to your economy, providing jobs, an outlet for your feed grains. Any that are damp or spoiled a bit can be utilized, as you know, hogs will eat a variety of different types of rations.

I'm told that the ground water is quite salty here in some of the areas. Hogs need fresh water, real good quality water. Natural water could be used from your lakes and rivers so any location of a hog production unit would be according to water supply, in proximity to it. With the colder winters, the buildings would need to be insulated well. I would try to find a location where the north side of the buildings would be partly underground; we could also look at solar energy. Underground buildings would be warmer in winter, cooler in summer. Don't copy any specifications on ventilation or building structure designed for climates different than yours. They just won't work.

When we speak of hog feed, we can be very broad, as hogs eat nearly everything we do. This a.m. at breakfast, I was speaking to a gentleman who lives further north, involved with, I think he said hogs and a dog on an island. They were small hogs when he put them out there, were fed wastes from the store - they took a canoe out there to feed them. When they were small, they fed them regular hog feed. The dog did the best, he ate first, then the hogs got some food. When they killed the hogs, they weiged 200 pounds, so you see they're not hard to raise. The black flies didn't seem to bother them too much.

You could produce a lot of meat using small units. If you had abbatoirs or killing plants to process and cure the bacon and hams for you, you would certainly have a real great industry here.

We have a strictly finishing operation, feed 5000 hogs at a given time, and in a month use 10000-15000 bushels of wheat and barley, 6-8 tons of vitamin and mineral pre-mixes, 40 tons of soybeans or equivalent protein mixed with our own electric mixmill. If you produce seed grains here, you could be producing beans or lentils as protein additives, also rape for granola meal. When we feed direct protein supplements, we prefer lentils. Peas can also be used, the smaller ones need to be blended in with soybean or granola meal.

Manure disposal is another aspect of pork production, large holding tanks for spreading in fields when conditions are favoruable, are not that hard to obtain. Digesters are also used in the U.S.; we in southern Manitoba will be using them shortly. It's a process whereby you take the liquid away from the dry matter - it comes out with 14% protein content, and can be used in feed lot operations as an additive to feed.

I'm really excited for you on your initiative to feed yourselves; you need dedicated producers to maintain continual production, with the support of all the related interests. Hogs have bailed us out for a long while, and have saved a lot of mortgages and paid a lot of taxes. Give the hog the benefit of the doubt.

(Thank you)

"MEAT, DAIRY, FORAGE"

MODERATOR, Hon, James Downey, Minister, Department of Agriculture, Province of Manitoba:

> Joe is held high in regard in Japan as well as in Canàda, and is looked upon as one who is truly expert in his field of crop production, and as one who has helped Manitoba in the development of markets - buckwheat in Japan, and other crops.

Joe Tsukomoto, speaking on:

"FORAGING".

I didn't include The Pas in my observations (as it) is already an agricultural area. However, what I say will also apply to The Pas. I wanted to bring corn into the discussion as well, though it is not recommended. What I mean by that is that quite a high standard is set. To your eye corn grows very well here. For feeding purposes, we like to have it mature. If we grow it in this area, forage crops, hay production, we should be able to harvest it twice a year.

On the basis of my studies and my personal observations of various forage crops that can be grown in the North but are not commercially produced there, I think that Canada has the potential to raise foraging livestock in the North.

Academically speaking, to feed ruminant animals with mature grain to yield milk or meat for human consumption is an inefficient way of approaching food production when the conversion factor is too low. It does not make any sense to me to use mature grain as feed for ruminant animals when it can be used directly for human food.

In areas where the production of good quality, mature grain is possible, it is better to concentrate on the production of grain for human consumption. In areas where the production of good quality grain is impossible but the production of forage is possible, it is better to utilize forage in raising livestock to yield meat and milk. Similarly with poultry, the production of domestic geese and ducks, which can forage up to 65% of their feed requirements, may be a promising venture in the North. I have been told by poultry specialists that ducks also are known to be one of the most efficient egg producers.

There has been slow development in agricultural production in the Canadian north because of such economic concerns as the distance to the market place, the accessibility of arable land elsewhere, and the abundance of agricultural commodities in southern Canada. The situation is changing gradually because of increasing land prices and limited available arable land in traditional agricultural areas. Furthermore, the development of natural resources in northern Canada is generating an interest in the development of northern agriculture.

"The North feeding the North" is a reality in a country like Finland. After the Second World War, Finland had a policy of producing all of her food requirements. Finland is located almost entirely above 60° latitude. It is well to remember that food production there did not take place without the support of agricultural research. There are strong agricultural research activities to support the agricultural industry in Finland. Similarly the Scandinavian countries, particularly Sweden and Denmark, have strong agricultural research activities. Perhaps the same may be true of the U.S.S.R. Also in the state of Alaska, there are research programs in support of agriculture. Canadian agricultural research in respect to the North remains inadequate.

Other factors than latitude, climate, altitude and soils are important in the adaption of various species of plants. Native vegetation immediately comes to mind. It can be utilized in livestock production. The production of native vegetation, however, is low. Consequently, productive tame forage, in combination with native vegetation when it is available, is the practical approach to forage in the North.

What tame forage is suitable for northern agriculture? In broad terms, research to date indicates that much of the forage that is cultivated in southern Canada can be produced in the North. These forage crops may be grouped into three types: annual, biannial and perennial. They may be suited for upland and lowland areas. They may be used for pasture or for stored feed such as hay or silage.

Among annual crops, oats provide a good forage. Seed is readily available and easy to produce. Oats can be used as pasture, hay or silage, Preliminary studies during the early years at the Whitehorse Experimental Farm indicated that most promising are oats harvested at the milk stage. In this test, following harvesting at the milk stage, aftermath growth occurred, but the aftermath was too short to be harvested.

Another test at Whitehorse Experimental Farm showed that among wheat, oats, and barley, barley is promising (Table 2). Although in this test barley was harvested at the milk stage as a hay, it would be better to harvest barley at the dough stage as a silage crop. Barley harvested at the dough stage and properly made into silage will provide a good source of energy for livestock.

It is interesting to note that barley was leafier than wheat or oats.

Oats and barley in the Pasquia area of Manitoba were harvested as grain. Results obtained between 1957 and 1969 indicate that oats and barley produce well in this northern region.

Italian rye grass is also reported to be a promising annual forage in the Pasquia area.

Silage corn production has been attempted in the Pasquia area. It was reported that silage corn is not suited to this area because of possible late spring and early fall frosts. The moisture content of silage corn at the time of harvesting also was high which is not desirable. This characteristic may alter in the future with further improvements in early maturing varieties and in seedling vigour when corn is grown under cool spring temperatures and when early seeding is practiced.

Because high yields of forage are possible with fababeans and field peas and because they grow fairly well in the North, there may be a place for them as annual forage for silage. They are annual crops; therefore, production costs and other practical aspects in growing these crops must be compared with alternative legume crops, such as sweet clover, red clover and alfalfa. Other annual forages that may be viewed in a similar light are kale, rapeseed and turnips. These crops grow well in the North.

Among biannual crops, sweet clover is important in the production of forage legumes in the North. Because of its type of root growth, in some years sweet clover can be severely infected with a disease known as brown root rot (Plenodomus meliloti). This disease attacks tap roots. Sweet clover, with a strong tap root system and very few lateral roots, has been an easy victim of this disease. In some years, the same disease also affects sweet clover in the South. In the past, after the severe effects of this disease have been seen in the spring, the damage has been recorded as winter killing.

Sweet clovers were tested at Wabowden by Agriculture Canada. Yields obtained during 1959 to 1961 were reported to be satisfactory.

In this test, it was recorded that the variety Cumino was seriously winter injured and, consequently, the yield was lower than that of the other varieties tested.

Biannial cereal crops, such as fall rye, may be used as forage crops if it is necessary. Fall rye is very useful as pasture when spring or fall pasture is short. In my experience, it is not a sound practice to use fall rye as a companion crop in trying to establish forage crops. This is particularly true in a season when the weather tends to be dry. Under such conditions, young forage will not compete with fall rye. Consequently, no forage will be established. It seems to me that the variety Sitnikoff has been the hardiest fall rye variety evaluated in the North. It is a variety from the U.S.S.R. and it is not licensed in Canada.

Winter wheat often survives in the North. It may be utilized as forage in a manner similar to fall rye, but it is not as reliable as fall rye.

Many perennial grasses that are grown in the South are hardy in the North. Grasses, such as crested wheat grass and Russian wild ryegrass, are hardy and are suitable early pasture. Russian wild ryegrass also is good for late pasture since it will not dry up quickly as does bromegrass after frost in the fall. Bromegrass is a very hardy upland grass. Intermediate and slender wheatgrass also are hardy upland grasses. Intermediate wheatgrass is particularly suitable with a legume mixture in hay production. Meadow fescue, timothy and reed canary grass are suitable for lowland area. Grasses, such as creeping red fescue and Kentucky blue grass which often are used as lawn grass, are hardy. These two grasses may be best suited for use in a combination of seed production and pasture.

Among these grasses that have been mentioned, brome grass, timothy, meadow fescue, crested wheatgrass and Russian wild ryegrass are perhaps the most reliable and productive grasses for use in pasture or a hay mixture, either alone or in combination with legume crops.

Red clovers and alfalfa are the most adaptable perennial legumes in the North. They can be grown either alone or in a mixture with grasses as pasture or hay crops. I saw a severe case of northern anthracnose (Kabatiella caulivora) disease on red clover at Wabowden in 1967. This disease can seriously affect red clover production. It is particularly detrimental when red clover is grown for seed production. Brown root rot (Plenodomus mililoti) can affect alfalfa and red clover plants as well as sweet clover. So-called winter injury or winterkilling should be examined carefully in the future in case of misidentification of this disease.

Red clover and alfalfa, tested at Wabowden between 1962 and 1964, are very promising.

Although alsike clover may not be as persistent as red clovers or alfalfa, it may be suitable for use in a grass mixture in lowland areas.

It is more practical to grow a grass and legume mixture than to grow grass alone because of higher yields and increased quality of hay, as well as pasture, through an increased protein content.

In selecting these forage crops, aside from considering their use, their establishment must be considered since it may limit the choice of forage. To clear and break bush for forage crop production, it is perhaps most economical to knock down and pile the growth after the ground is frozen so that the dozer blade will not penetrate the soil. This will avoid moving the top soil when piling the brush. The seed bed then can be prepared by using a Rome disc and seeding to pasture grass for several years. Spalings that may grow under these conditions can be controlled by herbicide. Much root picking will be reduced after the pasture has been in use for several years before being broken. There is a disadvantage in preparing pasture in the way that has been described. From time to time, plant growth in the pasture becomes so abundant that the forage cannot be consumed by livestock. It is practical to cut it for hay to be used at a later date. Land cleared in this manner is rough for haying. Also if forage is to be baled, dry tree roots often will enter the baler and too often shear off the pin of the machine.

Establishing forage crops on land that already is under crop production is no different from establishing forage crops in the South. A higher requirement of nitrogen generally is needed for grass production; whereas, a generous amount of phosphorus is needed for legume production, e.g. alfalfa hay production.

With a grass and legume mixture, a high rate of nitrogen will help the grass dominate in the mixture. Alfalfa will prevail if a high rate of phosphorus is provided under such a treatment.

Sulphur also may be needed in the production of both grasses and legumes. It is anticipated that potassium is needed in addition to the fertilizers already mentioned in highly organic soil, such as peat.

The trend of beneficial, residual effects on subsequent crops through forage crops often is exaggerated in the Pasquia area. For instance, it was reported from the Pasquia area in 1961 that oats after fallow yielded 22.4 bushels per acre; oats after grasses, 31.4 bushels per acre; oats after alfalfa, 46.6 bushels per acre; and oats after an alfalfa and grass mixture, 49.4 bushels per acre.

Harvesting practices for forage crops in the North are unique. At least at present, in harvesting hay crops in the North, it is the best practice to make a single cut and to maintain adequate soil fertility. This will then provide an opportunity for the plants to build sufficient reserve nutrients in their systems for the winter months. So far I have mentioned only a few possibilities of serious diseases that occur in the North. There are others, particularly diseases related to low temperature working fungi that prevails in the North. These diseases often are hosted by native vegetation, but they can affect domestic forage plants seriously when such forage plants are physiologically weak. This is why good winter reserves are needed by overwintering forage plants.

In the North, forage that is high in moisture must be partially wilted to reduce the moisture content sufficiently to make silage. Silage with high moisture will not be consumed readily by livestock. Furthermore, it can freeze severely and the use of such silage becomes difficult, if not impossible, during the winter months. Silage is used successfully in dairy operations in Alaska where extreme winter temperatures occur.

I have discussed briefly forage chiefly from the standpoint of livestock feed, and I have not discussed possible forage seed production. I must say that there is an opportunity for forage seed production in the North. The isolation needed for forage seed production is of little concern in the North; however, this subject may be the topic for discussion another time.

I must say that as one goes progressively northward, the sunshine hours increase during the growing season, cool temperatures prevail and the length of the growing season decreases. But the moisture efficiency of plants increases. Under these conditions, hardy adapted forage plants will grow very quickly once spring starts; therefore, one must fully and promptly provide all phases of care and management of the crop. It is of the greatest importance in northern agriculture to do all work from seeding to harvesting on time. This is the key to success for northern farmers as far as forage production is concerned. When successful utilization of forage by livestock is achieved in the North, the potential of forage production in the North will be fully realized.

There is a continued need for a well integrated group of northern researchers, however small in number, along with extension personnel, farmers, agribusinessmen and concerned politicians, if northern agriculture is to develop soundly and meet successfully the needs of the North.

(Thank you)

TABLE 1

RELATIVE PROPORTIONS OF HIGH PRICED MUSCLES IN CARCASSES OF VARIOUS SPECIES

SPECIES	PROX. HIND	SPINAL	PROX. FRONT	TOTAL
Cattle	28.4	12.5	12.5	53.4
Bison	31.2	13.3	12.9	57.4
Yak	24.7	12.9	14.0	51.6
Moose	35.2	11.1	11.4	57.7
Elk	30.7	12.0	16.6	60.2
Deer	31.5	15.2	11.1	57.8
Antelope	32.4	15.4	13.6	61.4

"MEAT, DAIRY, FORAGE"

QUALITY IN DOMESTIC AND WILD RUMINANTS

Prepared by Dr. Bob Richmond, B.C. Ministry of Agriculture,
Kamloops

(note: Dr. Richmond was unable to be present at the seminar. His paper is included here for the information of the reader.)

Addressing the concept of the North Feeding the North requires two things: 1) that we define what we mean by the north, and 2) that we shed the confines of tradition and use some imagination.

Those of you who attended the annual meeting of the Agricultural Institute of Canada in Edmonton last month will remember that defining the north depended on where one lived. For example, those of you from Winnipeg probably consider The Pas as being the north as being somewhere beyond Thompson. As Sir Kenneth Blaxter so aptly described it, "The north is further north, the further north you go".

When we talk of the north we are really referring more to an environment than a direction. And, the environment we refer to usually has several identifying charactertistics: its climate is variable and often harsh; it is only marginally productive and requires major modifications to support traditional agricultural systems; it is isolated and sparsely populated. As we study these characteristics carefully we begin to realize that they could also define environments east, west or south and not necessarily just north. However, for the purpose of the seminar we will consider the direction as north.

My definition of the north then will be any environment which either through geography or climate restricts the normal agricultural process of raising traditional food products. The food product I am most concerned with is meat.

The production of meat in the north brings us to the second requirement; that we shed tradition and use some imagination. A better description might be to take inventory of our resources.

The production of red meat in North America has relied almost entirely on three or four domestic species the cow, pig, sheep and goat. It might be more correct to say that the production of red meat has relied entirely on our ingenuity in manipulating and modifying the natural environment to ensure the survival of these species. In many cases manipulation meant evicting large numbers of indigenous species more suited to the environment but not so suited to our social and political tastes.

Raising domestic species is dependent on relatively large inputs of fossil energy in developing the summer and winter food supplies necessary for their survival. Refining management techniques can reduce the requirement for fossil energy but only slightly. The alternative to using animal species which require maximum supplementation is to use indigenous animal species which are adapted to the environment and which require little if any supplementation to survive and reproduce.

TABLE 2

AVERAGE WEIGHTS AND CARCASS COMPOSITION OF VARIOUS SPECIES

Species Age	Cattle 1.25 yrs	Bison 2.0 yrs	Yak 7 yrs	Moose 2.5 yrs	Elk 2.5 yrs	Deer 2.5 yrs	Antelope mature
Live-weight (lbs)	1047	917	-	640	563	146	-
Carcass Weight (lbs)	657	514	614	348	316	82	66
Dressing %	63	56	-	54	56	56	-
Carcass Composition							
Muscle %	59	72	75	77	73	74	77
Fat %	29	12	7	6	10	10	6
Bone %	12	16	18	17	17	16	17

The balance of this representation is devoted to a very brief review of muscles (meat) growth in animals and the qualifications of some of our indigenous species as potential meat producers.

Form follows function. Each tissue in the body of each individual species grows and develops relative to evolutionary functional demands. The primary function of tissue growth is to ensure the survival and reproduction of the species. The fact that man finds some tissues of the body a convenient and pleasing source of food is secondary and has little bearing on the functional requirements of the tissue. Attempts to change the differential development of tissue in the body can only be successful if there is some adaptive advantage to the species. The major body tissues in the carcass of animals which are of importance to man are muscle, bone and fat.

Bone provides a framework for the softer tissues and is the earliest developing tissues in the body. Muscle provides both a work force and supporting mechanism for the body and grows at a more rapid rate than bone on the post-natal period. Fat is the latest developing tissue and, unlike the more rigid, fixed bone and muscle tissues is relatively fluid.

In the post-natal animal bone growth is well advanced with the lower limb bones being well developed to meet the initial requirements of walking and following its mother. As growth proceeds bones grow in both length and circumference to support and move the increasing weight of the other body tissues. Muscles repsonsible for initial mobility and suckling, muscles of the lower limb, neck and jaw muscles, are well developed at birth. Shortly after birth muscles of the upper limbs exhibit rapid growth in response to the functional requirements for increased mobility and propulsion. The new born animal has relatively little body fat. As growth advances beyond birth energy, surplus to that required for bone and muscle growth, is stored as fat and is deposited at increasing rates in the body cavity and between and within muscles. Generally fat shifts from depots of high resistance, such as those around the large closely attached muscles of the hind limb, to depots of low resistance, such as those around the more loosely connected muscles of the forelimb, and the subcutaneous area where skin is loosely attached.

Figure 1 illustrates the general growth patterns of the three major body tissues. Bone is the earliest developing tissue followed by the more rapid growth of muscle. Fat grows at a rate relative to that of bone until sufficient energy is available to allow it to increase at will. This is generally referred to as the fattening phase and varies relative to mature weight of the breed and plane of nutrition as illustrated in Figure 2. Early maturing breeds reach their mature carcass proportions at early weights and have an early onset of fattening while the latter maturing breeds fatten later and at heavier live weights. Nutrition can effect carcass composition in a similar manner. A high plane of nutrition would shift the fattening line to the left and a low plane would shift it to the right. Evolutionary adaption to an environment is accompanied by specific shapes and forms of tissues to accommodate specific functional demands placed on it.

TABLE 3

PROXIMATE CHEMICAL ANALYSIS OF MEAT SAMPLES FROM VARIOUS SPECIES[1]

	% Moisture	Protein (gm./100 gm.)	Fat (gm./100 gm.)	Energy (Cal./100gm.)
Beef - prime	-	13.6	41.0	428
good	60.3	18.5	20.4	263
standard	-	29.4	15.8	225
Lamb	61.0	16.5	21.3	263
Pork	56.3	15.7	26.7	308
Caribou	-	27.2	4.7	120
Moose	72.4	25.1	2.5	123
Deer	74.0	21.0	4.0	126
a) deer male	66.7	22.3	10.6	222
female	68.0	22.6	9.2	206
b) elk male	73.4	21.8	4.5	155
female	68.2	23.0	7.8	205

[1] Source (Anonymous, 1972; Field et al, 1973; Spillet et al. 1975)

Potential Production

Having established a case for including wild species in a northern food strategy there is always a temptation to project their production potential. Such projections are speculations at best and are beset with all kinds of hidden factors lurking beyond assumptions ready to spring out at any moment and destroy even the most meticulous of plans.

Some time ago we conducted a study in which we projected the productivity of various ecological regions in Western Canada. Figure 5 outlines the major regions and Table 4 gives the estimated productivity of each region by specie mix. Considering that these figures assume a 12 month grazing-browsing period it could be somewhat difficult to argue in favor of domestic animals if environment is the basis of comparison.

Animal breeders have expended considerable energy over the years in an effort to develop meat animals with a high proportion of muscle in the more desirable cuts. It is somewhat of an embarrass,ent to find that these efforts have been to no avail. Studies by Berg and Mukoty (1970) have shown that muscle distribution is similar among beef breeds, selected for muscle development, and diary breeds, selected for milk production.

To add insult to injury we now find that the wild, unselected species have a higher proportion of carcass muscle in the more desirable cuts than do domestic species. This is due primarily to the evolutionary adaptation of this tissue to the functional demands placed on it by the requirements of the animal to survive and reproduce natural environment. Unlike domestic species the muscle function in the wild animal must accommodate speed and agility. Somewhat fortuitously these are the same muscles most desired for meat.

To demonstrate the qualifications of indigenous species as alternative meat producers I have chosen seven candidates: the moose, elk, deer, antelope, buffalo, horse and yak. The reason for selecting these species is that I have had some experience in raising at least some of them, they are all adapted to northern environments and, last but not least, they are the only ones I have any detailed data on. Three other species which have a definite niche in northern food systems are the reindeer, caribou and to a lesser extent, the musk-ox.

By separating muscles into functional anatomical groups we (Berg and Butterfield, 1976; Richmond and Berg, unpublished) have found that, compared to cattle, moose, elk, deer, antelope and bison have a greater proportion of their muscle in at least two if not all three of the high priced carcass cuts, namely the round (proximal pelvic limb), the loin (spinal column) and the chuck (proximal thoracic limb). The horse has a greater proportion of muscle in the round and the yak a greater proportion in the chuck than do cattle (Figures 3 and 4, Table 1).

The relative proportions of muscles, fat and bone in the carcass are also quite different between cattle and wild species (Table 2). At slaughter age cattle have approximately 59% carcass muscle and 29% carcass fat while wild species vary from 72% muscles and 6% to 12% fat. Some of this difference is related to diet but a good part is the result of selecting cattle which fatten quickly.

Comparisons of meat quality, as determined by proximate chemical analysis, are shown for some species in Table 3. Wild species have a greater proportion of protein and a smaller proportion of fat and calories per 100 grams of muscles than do domestic species. Again, a part of this can be attributed to diet and the amount of "finish" on domestic animals compared to wild animals. It is of interest, however, that the standard grade beef, which has very little, if any finish, had a protein content equal to that of wild animals but still had a fat content far in excess of the largest value reported for a wild species. The reason for this may rest in the fact that fat deposition in wild animals is primarily inter-muscular while domestic cattle deposit a considerable amount of fat in the intra-muscular depot.

In conclusion, I would suggest that the species considered here have distinctive advantages over domestic species as a meat source, and not just for the north.

1) They have an evolutionary adaptation to the environment which mitigates the need for excessive energy inputs.

2) They are equal to or superior to cattle in carcass composition and meat quality.

3) They have a relatively high potential productivity.

TABLE 4

EXPECTED PRODUCTIVITY AND YIELDS FOR VARIOUS SPECIES IN DIFFERENT BIOMES

Note All data based on approximate carrying capacity of one square mile and harvest rate of 25% annually.

Ecological Region	Species	No./sq. Mi.	Yield (lbs.)	Total Yield (lbs./sq. mi.)
Prairie	Bison	25	480	3,000
	Elk	15	288	1,080
	Deer	40	89	890
	Pronghorn	60	56	840
Aspen - Parkland	Bison	18	480	2,160
	Moose	12	400	1,200
	Elk	15	350	1,080
	Deer	60	105	1,335
Boreal - Mixedwood	Bison	15	480	1,800
	Moose	12	400	1,200
	Elk	12	350	864
	Deer	40	105	890
Coniferous Taiga	Caribou	20	120	505
	Moose	6	400	600
Tundra	Caribou	13	120	1,560
	Muskoxen	2.2	120	264

The question is really not one of should we use them, but one of can we afford not to use them.

(Thank you)

"MEAT, DAIRY, FORAGE"

MODERATOR, Hon. James Downey, Minister, Department of Agriculture, Province of Manitoba, introduced

Blake Donohoe, Donohoe Farms Ltd., Brandon and The Pas, speaking on the topic:

"DAIRY"

Mr. Chairman, Ladies and Gentlemen:

Before I get into the main thrust of my comments I am going to ask your patience while I get a few personal comments off my chest . . .

First of all, congratulations to the organizers for having taken a rather large initiative and organized this event . . .

It delights me that you have done so . . . it delights many of my farmer friends as well . . . all too frequently we see evidence of a belief . . . a sorely mistaken belief, by the way, that all of the intelligence in Manitoba is to be found on the inside of Winnipeg's perimeter highway . . .

When I see the proof positive of the intellectual vigor of non-metropolitan Manitoba I become excited . . . to me it represents just another sign that rural Manitoba is coming into its own . . . and about time!

Point number two . . . this is my personal thanks that those skillful organizers invited me to attend . . . and to speak . . .

They don't know it, but they did me a huge favor . . . they forced me to sit at the kitchen table . . . hours on end . . . putting notes on paper . . . writing myself letters . . . it got to the point that during my hours in the milking parlor I got to arguing with myself . . . and that didn't do a thing for my milk production, believe me!

Now, central to everything I tell you today, is my faith in that precious commodity known as milk . . .

I feel that way because I am a dairyman . . . I support my own agricultural specialty . . . I am the son of a dairyman . . . I have four sons who are dairymen. As I go about the farm chores I think that those delightful grandchildren who love to keep me company, stand to become dairymen . . . dairywomen . . . dairypersons if you're liberated . . . which would make them the fourth generation of Donohoes to be associated with dairying . . . the dairy business is my life . . . I must take it seriously.

For as long as Man has had a written language milk has been not only a popular word, but also one of strong symbolism . . .

Even modern politicians like Winston Churchill found it useful to use milk in their public campaigns . . . in 1943 on one of his famous radio broadcasts Churchill told his vast audience that "There is no finer investment for any community than putting milk into babies" . . . quite naturally, Mr. Chairman, I am always pleased to associate myself with the beliefs of that great British leader! . . .

But . . . talking about Churchill and his political campaign is only a sneaky means of helping me to introduce today's subject . . .

Yes, I am going to talk about milk and dairy herds . . . and yes, I am going to talk about The North Feeding The North . . . but to do so I must first establish a foundation . . .

Now, I am not a practiced orator, as you know by now, but I am sufficiently interested in this subject to be certain of this . . . writing a speech is not all that different from building a house . . .

It all begins with a foundation . . . . a firm and substantial one, preferably based on solid rock . . .

Here comes the Donohoe philosophy on the milk industry . . .

Milk and politics are so intertwined that you can't tell where one leaves off and the other begins . . .

Milk and politics go together more naturally than peaches and cream . . .

Somewhere along the line we dairymen left the barn door open and a politician sneaked in . . . and stayed . . . and multiplied . . . and now has become a permanent fixture.

If grain farmers believe they have it tough because their wheat is 15% protein and 85% politics, then I insist that that's only kid stuff . . ..

From my observation, milk is 2% butterfat and 98% politics . . . and the butterfat content is shrinking . . .

THE NORTH FEEDING THE NORTH . . . as I salute your organizers for a great idea, let me commend them as well for a great title! . . .

And The North Feeding The North is more than a title . . . it is also a vision . . . a great one . . . I'm interested in visions . . . from my parents and grandparents I inherited a strong belief that planning . . . and perseverance . . . and a lot of honest sweat can turn visions into realities.

OK . . . that introduced another key word . . . reality . . .

You are all practical people . . . you are accustomed to dealing with realities . . . so here are the realities of your challenge as I see them . . . and they are based upon the realities on the Donohoe experience in The Pas . . .

If you are going to invite more dairymen to produce milk north of '53 then you may as well think about what's happening with the dairy producer you now have . . .

Let me begin with a positive statement . . . we're glad we have a milk herd at The Pas . . .we thought about it for a long time before buying . . . we felt we had allowed for all the problems that might develop . . . and we didn't, mind you, and I'll get to that in a minute . . .

OK . . . let's go . . . my father insisted that you can't make a hard decision until you take the topic at hand and surround it with hard thinking . . . pro and con . . . advantage and disadvantage . . .

First the advantages . . .

It is a great learning experience for two young dairymen who want to learn the business . . . that's good . . .

And it is fortunate that they are young . . . for this is a young man's land . . . up here you have to be able to adapt . . . to cope . . . to make the best of unusual weather and errative services . . .

There is good soil available in this area . . . perhaps some of the best in the province . . . it is fertile loam . . . it is capable of producing good legumes . . . good grain . . .

And the final advantage is to be found in the spirit of the people . . .

But at that point I stop my reading of the list of advantages . . . there really aren't any more that I can think of right now . . .

Friends . . . things are different when it comes to the disadvantages . . . believe me . . . there are a host of them . . .

Let's begin with economics . . . it is costly to do business up here . . . those freight rates are going to kill some business enterprises . . . there is hardly a thing which doesn't feel the impact of rail and trucking costs . . . and in our dairy business, freight costs are a big item in the budget . . .

Let me talk for a minute about water . . . a commodity vital to a dairyman . . . a producing cow can drink 40 to 60 gallons of water a day . . . and for washing-up ./././. and for flushing the milking system, we need much more . . . much more than any of you might think . . .

Water is one of our big problems at The Pas . . . and I do believe that our water problems are much worse than they need to be . . .

Water from deep wells is so salty that humans can't drink it . . . and cattle drink it only under protest . . .

And yet I understand there is sweet and potable water available from shallow wells, but they are plagued by silt . . . fine silt which eventually plugs main lines, toilets, taps, reducing efficiency as it creeps in . . . Now as a diaryman with operations in both the South and the North, I'm in a position to do some comparisons . . . I believe that in the South there are well-drilling techniques which are not yet used up here, and to your great disadvantage . . . one of my neighbors sat in my kitchen a week ago and told me that just ten years ago a well-driller was just a man who had the equipment to bore a big hole in the ground . . .

Well, that's not the case today . . . there's much more to it now . . . today a well is a water source that is not just drilled . . . it is developed . . . there are screens . . . and baffles . . . and a variety of styles of casings . . . and the screens have perforations in a great variety of sizes . . . and all of these instances of technology have been developed by research in faculties of geology . . . with help from the western petroleum industry . . .

A couple of weeks ago I decided I'd make history up North . . . I was prepared to invite one of our southern well developers to open up some new water sources for our dairy farm . . . and to my surprise, he's booked up over a year in advance . . . friends . . . he must be doing something well if he's booked up over a year in advance . . . friends . . . he must be doing something well if he's got advance bookings like that . . .

Anyway, here's my suggestion for you . . . with the government providing grant monies for well development in the drought relief program, I recommend that someone in this room make some enquiries about more water well research in this area . . . without strong supplies of fresh, sweet water, it's difficult for me to see how you're going to develop a hustling food business north of '53 . . .

Mr. Chairman and friends . . . while I'm still on my list of disadvantages, I must make a general comment . . . it is not likely that you can go much beyond your present food production until you solve the problem of local commercial services . . . and local professional services . . .

Let me begin with telephones . . . in these days of modern farming practices, communications is vital . . . poor communications will mean poor income, so directly are these matters linked together . . .

To make hay while the sun shines is the oldest farming expression I can think of . . . and it's still valid today . . .

But Mr. Chairman . . . north of '53 there will be times when you can't make your hay while the sun is shining . . . because while you're in trouble out on the farm, you are not in touch with town . . . or with the nearest city . . .

You'll be out of touch because of the scandalous service offered up here by Manitoba Telephone System . . .

Mr. Chairman . . . the modern farmer needs communications just as surely as he needs land and credit . . . he must be in touch with the world . . . he must sell commodities . . . he needs parts . . . and fuel . . . and herbicides . . . . and a whole range of chemicals . . .

In my Dad's time that telephone on the kitchen wall was a luxury . . . at that time self-sufficiency was the key to each farming operation . . . if you wanted to go to town . . . or wanted to talk to someone in town . . . well, that would wait until you went in there next Saturday . . .

That's not . . . repeat, not the case today . . .

* * * * *

I think I quite rightly described the northern telephone service as scandalous . . . certainly it is a scandal to me that an agency like Manitoba Telephone System . . . which does such a superb job in southern Manitoba . . . and leads in communications research with its experimental installations at Elie and St. Eustache . . . should turn its back on The Pas and other northern communities, and their farming areas . . .

there is just no other way to describe a service which on occasion lets subscribers go a week . . . two weeks . . . three weeks . . . without service . . .

Here I speak comparatively . . . and from personal experience . . . if the farmers in the south . . . any of them . . . had to suffer through the type of service the telephone company offers in the North . . . there would be Hell to pay . . . with letters to editors . . . with angry debates in the legislature . . . I mention this to let you know that perhaps this wheel isn't speaking loudly enough . . .

* * * * *

Mr. Chairman . . . one of the reasons we need that telephone, of course, is to call for still other services . . . many of which are not here yet . . . and are needed . . .

This area needs a veterinarian for large animals . . . today when we need a vet we must contact the man in Swan River . . . when we do so we guarantee a $50 service call . . . we pay mileage and time on top of that . . . for one visit to one animal the bill may be $150 . . . and please understand me . . . this is a highly qualified practitioner who renders good service . . .but instead of having a local vet, we must import the nearest one at what must be described as an unusual expense . . .

This is a service too costly for commercial beef operators . . . and there's more to it than just trouble calls for the present herds . . . the presence here of a veterinarian will bring more cattle to this area . . . I know we can get into a chicken-and-egg argument here over whether the herds come ahead of the vet . . . or is the vet here first . . . but I take the position that I would not want to establish a large commeercial beef herd up here without the professional services to support it . . .

On a related subject . . . let me say you need a source of veterinary supplies . . . there is a need here for a standard inventory of animal health medicines and vaccines . . . in the South . . . even in the smallest towns . . . if there is a drug store, there is a corner set aside for this purpose . . . and there is a greater need for this type of material than you might think . . .

Today, if we need something from that line, and it is over and above the supplies we carry in our own animal medicine chest . . . we telephone Swan River . . . if the telephone is working, that is . . . we pay for that long distance call . . . we pay a package freight bill of something like $4.50 . . . and we get next-day service . . . and there are times when we don't want to wait until next day when an animal's in trouble . . .

On still another related subject . . . you need a killing plant . . . and this is not a really big deal . . . the province is dotted with them . . . Dauphin has one you could emulate . . . killing once a week . . . twenty or thirty beef animals . . . thirty or forty hogs . . . often done on a custom basis . . . eventually this will be supported by an auction market which helps to integrate the process . . . this means that local beef could be auctioned locally . . . slaughtered locally . . . reduced to prime cuts locally . . . and sold through retail outlets to local consumers . . .

Without a service like this, the beef producer north of '53 is faced with the frightening prospect of hauling his finished product a long, long way to a community where such a service is provided . . . and there goes the profit.

You need an implement dealer . . . and here I hope it is an all-purpose dealer, rather than one committed to one implement company . . . as I drive around your area, and see the wide variety of manufacturers represented on area farms, I conclude it will not be easy to supply them with parts from a dealership committed to one line . . .

But those farm implements are not going to grow in number unless a local dealer can keep that equipment in operation . . . it's as simple as that.

Getting away from commerce for a moment . . . and getting into public services . . . let me touch upon the touchy matter of drainage . . .

Now . . . let me explain in advance that here I speak as a layman . . . as an observer only . . . I am not a drainage expert . . . but my observations tell me that there appears to be a lack of co-ordination in your drainage program . . .

In this regard I am thinking merely of what I see . . . I see some drainage ditches being cleaned out year after year . . . while others a few miles away seem to be ignored . . . I see flooding which I believe could be avoided . . . flooding which brings salt to the land which can only hurt production . . .

Someone in this room surely can explain this better than I can . . . so perhaps I'll just ask the obvious question . . . is there a need for a master drainage program in which the province . . . the municipalities . . . and the local government districts . . . all co-operate?

I ask this because as a working farmer . . . one who is obviously interested in the land . . . I believe that good high land is being overlooked . . . while some low lands get all the attention. . . .

* * * * *

Some of the agrologists in this audience will speak on this next subject better than I will . . . but I have a belief . . . a strong belief . . . that when you get your drainage program working, you have a great future potential in alfalfa production . . . from my observations you have both the soil characteristics and the rainfall for this valuable crop . . . if my belief is correct, then this gives you still more potential as an area in which beef production will become important . . .

* * * * *

Mr. Chairman: at this point I wish to commend the Manitoba Department of Agriculture and its local representative for one local program which is working . . . and working efficiently . . . and each year wins more support from area farmers . . .

I speak now about the Grassland Project . . . under this project a public area was opened up . . . and developed . . . and seeded to tame grass . . . and farmers are permitted to run their cattle there in the style of a community pasture . . .

My family has supported this program since it began three years ago . . . each year more area farmers are co-operating . . . we know from experience and observation that our cattle come off that pasture with more weight gain than if they had been living on native grass . . .

It is my opinion, Mr. chairman, that this is an excellent example of land utilization, of public land management.

At a time when we need an example . . . a practical, working example of farmland potential north of '53rd, well, we have one . . . right here on our own doorstep.

Mr. Chairman . . . I am now about to move from hardware . . . things like telephones and implements . . . into things of the spirit.

It is my experience that nothing happens without motivation . . . to have motivation, you must have the will . . . you must want to do something . . . and want to do it very much . . . you must be prepared to take an initiative . . . you must persist when the going gets tough and when you first encounter resistance . . .

I say the signs are good that the North can feed the North but only if a number of items fall into place . . .

First of all . . . the North must show that it has the motivation and the spirit to want this food production so badly that the people down South . . . and the government in power . . . will permit that to happen . . .

Remember now . . . before you let your optimism carry you away from the world of reality . . . that a number of big things must happen before you turn this land into an extension of the southern breadbasket . . .

You must change a lot of thinking up here . . .

You must change a lot more thinking down South . . .

You must develop in your own people the spirit to make this campaign work ./././.

And you must convince a lot of people down South that it should work . . .

Think about this, my friends . . . a lot of people down South like the Manitoba Food Distribution pattern exactly the way it is today . . . and it is in the nature of business that they are going to resist any change which puts their profits in peril.

But of even greater important . . . please remember this . . . there will be no more food production north of '53 in the years to come . . . not one more litre of milk . . . not one more calf . . . or lamb . . . or hog . . . or bale of alfalfa . . . unless all of you people . . . all of you, that is . . . bury a lot of differences and work together to make this happen . . . and don't think it will be easy.

To begin with, you have the matter of the public boards and agencies which rather like things the way they are . . . and are notoriously slow to change . . .

To make things happen up here . . . you are going to have to coax every branch of every department of every government to co-operate with you . . . and you don't have all that much muscle . . .

My memory tells me your number is somewhere around 80,000 . . . less than ten percent of the provincial population . . . friends . . . to develop big clout you will have to work ten times as hard as the people down South . . .

Let me give you an example of how you are going to come into direct collision with government regulations . . .

The North needs more milk . . . a lot more milk . . . and our farm could give you a lot more milk but by provincial regulation we're not permitted to . . .

All Manitoba dairies operate on a basis of D.E. . . . D.E. stands for daily entitlement . . . your daily entitlement is all you are permitted to produce without paying a financial penalty . . . you get your daily entitlement by the measure of your milk production during a specified seven-month period each year . . .

Now, those of you out there who dream about turning this area into a land of milk and honey had better think again . . .

In this present year, our dairy farm is paying financial penalties . . . penalties running into hundreds of dollars . . . for shipping more milk than permitted under our daily entitlement . . .

In case you notice a touch of bitterness in my voice, let me tell you that I take exception . . . keen exception . . . to a system under which a government agency slices $400 or $500 because a dairy farm north of '53 produced more milk than its daily entitlement . . .

Stop and think what this means . . . at a time when you . . . and your family . . . and your neighbors . . . are paying the freight costs to bring in milk from other producers . . . milk from Saskatchewan . . .from Winnipeg . . . from as far away as Steinbach and Altona . . . a local producer is being penalized . . . up to $400 . . . for producing milk that you need . . .

Think also about this before you invite in another dairy herd . . . and that's a move that would be good for this area . . .

That a new producer arrives on the scene with a list of capital costs that will astonish you . . .

First of all he must purchase land . . . and then he needs barns and holding pens . . . and they range right now around $2,500 per animal . . . and then he has to buy a herd . . . and when he does go into business, he will run head on into those regulations . . .

He will have the privilege in his first year of shipping all of the milk he can produce . . . that privilege continues one year only . . .

And then he goes through a period in which he will establish a D.E. . . . a daily entitlement . . . and once he has that his operation is frozen at that level unless he can go out and borrow more money . . . buy more milking cows . . . and slowly each year push that daily entitlement upward . . .

Take it from me . . . I know . . . my sons know . . . it is a laborious and expensive matter to increase your milk production under the rules as they now exist ...

The consequences of this are quite clear to me ... I believe as well they will be clear to you ... rather than go through all of that in a semi-remote area north of '53 ... he will likely make his investment elsewhere ... you would ... and I would ... those regulations for the beginner ... are simply too tough to deal with ...

Mr. Chairman ... let me not be the representative of agriculture who spreads gloom and sorrow over this interesting audience ...

By nature I am not a Jeremiah who goes through life spreading lamentations ... I think I'm more optimistic than pessimistic ...

But I'm also a realist ... and I'm just painting this picture as I see the scene ...

It is my opinion ... it is my firm opinion ... that the regulations which cover agricultural production right now will make it difficult ... extremely difficult, for you to grow a lot more food in this area ...

But don't be down-hearted ... and don't for one minute stop working toward your goal ...

For a model of how to achieve that goal, I think what you have to do is ask the various levels of government to classify this area as a new frontier ...

Under frontier status, as I see it, you seek exemption from regulatory boards like marketing agencies ...

At a time when you need milk, I believe you should be able to encourage milk producers to sell into the local market all the milk they can produce ...

I understand from a newspaper story that there is a sufficient local market for a flock of 20,000 laying hens ... but I am told as well that the reason you do not have that flock is that it requires a licence ... and there is no licence available for this territory . . .

Mr. Chairman . . .these are only random examples of how the dream of The North Feeding The North is bound up in regulations . . . regulations which favor the producers in the South . . . regulations which penalize the producers in the North . . .

* * * * *

And please do not believe that I am downhearted by your chances of success . . .

It is my opinion that you have taken your first step toward your goal . . . you have raised the subject at a public meeting . . . you are recruiting supports, and certainly my family and I want to be included among your supports . . . I am convinced that you have the press and the radio on your side . . .

I believe that the greatest thing going in your favor right now is the steady increases in the cost of fuel . . . the costs of freight are now so high that no government can ignore them for long . . . those freight costs are making it imperative that you grow more food of your own because the freight costs on imported food will be prohibitive . . .

* * * * *

Best of luck to you in your campaign . . . and I hope that as your program develops, there will be some way you and your committee can use the help of the Donohoe family . . .

We'd be pleased to help . . .

(Thank you)

"MEAT, DAIRY, FORAGE"

MODERATOR, Hon. James Downey, Minister, Department of Agriculture, Province of Manitoba, introduced

Karen Wittenburg, Dairy Specialist, Department of Agriculture, Province of Manitoba, speaking on:

"GOATS"

I am not a goat specialist, but I hope some of the things I have to tell you will help you, and satisfy some of the interest that people in the North have indicated they have in goats. These are some of the objectives I saw arising out of the North Feeding the North: initially and most important, it allows the North an opportunity to become self-sufficient for meat, meat products, milk products and possibly egg products. I speak more of the livestock industry than just of goats. This would mean that there would be a reduction in the drain of money to the South for food products that are required. Also there would be a greater availability of fresh produce, and produce in general for the northern community. I spoke to nutritionists, home economists who worked in the North, and one of their major complaints is that the availability of fruits, vegetables and dairy products is limited. There could be a development of an agriculturally based industry, the ultimate goal being some sort of export trade, something that would develop over a long period of time. Certain specialized products could find a market in southern parts of North America - forage seed production, potato seed production, have a potential. Another example might be the production of deer or caribou meat for southern restaurant trade.

What factors influence the northern community trying to develop a viable livestock industry? Farming in the north will be influenced by political socio-economical and biological factors.

Can you expect the development of a favorable national economic program? This would mean subsidized transportation of feed to the north, training programs, etc. Also, a conflict can be expected between conservationalists and the livestock industry, regarding large predator control.

Possibly the major and least recognized is "northern psychology," the fact that agriculture in the north is impossible. This is not only the viewpoint of the south, but of many northern communities as well. Also, many native northerners are not farmers in the traditional sense. How do you approach this problem when attempting to develop a livestock industry?

a) You could develop several large intensive farming units run by imported, trained persons.

b) You could develop training programs and demonstrations to teach the northern native nutrition, management, housing, etc., requirements for domestic animals.

c) You could develop an industry based on northern undomesticated animals.

There are definitely socio-economic advantages in developing a northern livestock industry. The impact on rural health and nutrition is probably the most significant contribution, especially for people living on the poverty line and to the vulnerable groups, the pregnant and nursing mothers and the young.

If individual families had a few dairy animals around, there would be a consistent supply of meat and milk which, although small, can make the difference between adequate nutrition and malnutrition.

In terms of both livestock and plant production, one important factor must be realized - you can not rely on means and averages when trying to deal with the northern climate. There are increased climatic variations as the growing season becomes shorter and there is less predictability of the outcome of the harvest.

Biological factors which influence livestock production in the north include the pests (biting flies and large predators), and the climate. Not only must the livestock manager have to deal with the cold, but also with the snow. Also, it is the temperature fluctuation more so than the cold itself, that affects animals. If a confinement system were to be used, a sophisticated ventilation system is required to cope with these temperature changes. Finally, there is always the vulnerability to power failure.

The northern livestock producer is forced to rely heavily on the available resources to develop a viable operation. The use of a superior bull or buck will not accomplish as much in terms of increased productivity as will, for example, controlled grazing of pasture on the timing and length of the calving season.

For these and other reasons, ruminants are considered to be the key to the development of a livestock industry in the north. They can be fed locally-grown feed (forage) and still be productive.

When I was approached to speak to you, I was asked to discuss the value of the dairy goat, relative to other livestock species, as a potential meat and milk supplier for the north. In the case of dairy cattle, herds that would establish here, would have to be located near large tracks of arable land. The land would have to be capable of supplying 100 percent of the forage requirements and some high energy feed requirements. The management would likely be intensive, such as the operation located here at The Pas. A nearby milk processing plant would be responsible for processing and distribution of milk in the northern communities.

Should the individual family units be encouraged to own a few cows? Some obvious problems which come to mind are:

1) cost of maintaing a sire;

2) the high winter feed requirements;

3) housing and handling equipment costs.

Before discussing goats in our north, let's look at some world trends in goat husbandry in colder climates.

1) Meat production is of primary importance.

2) Milk production is uncommercialized and of secondary importance.

3) Present production levels are low because of inadequate feed supplies.

4) Ownership of small flocks is common (approximately five) and large herds are uncommon.

5) Marketing patterns are weak, disadvantageous to farmers and limited organized marketing is apparent.

6) With few exceptions, goats are low in priority within livestock development programs.

7) Limited trained manpower and inadequate training programs are apparent, (much of this is due to a lack of knowledge and research of goats).

Table 1 will provide you with some idea of how cow and goat milk production compare.

There are many characteristics of the goat that make it a suitable animal in areas of marginal land and low density, isolated populations.

The low individual value means a low initial investment cost and a correspondingly small risk of loss in event of death.

The small size and even temperament of the animal make it easy to use unpaid family labour (namely: women and children). Also, the meat and milk is supplied in quantities suitable for immediate consumption.

With minimum or marginal land and a low feed availability, goats are more likely to survive and be productive, than cattle or bison. Why is this the case? Much of the difference is related to the different feeding habits of the various species. Goats browse more readily than do sheep - which browse more readily than cattle (most wild ungulates are also browsers). Goats like a varied diet, consuming anything from grass to weeds to twigs and buds. This gives the goat an advantage in areas having native plant production. They also do well on tame grass and hay, although their efficiency relative to other ruminants is the same.

Something else I should mention at this time is that the goat readily fits into a multi-species grazing system. That is more than one species is allowed to graze in the same pasture. In virtually all studies conducted, this practice improved productivity per unit of land. Why? By combining grazing and browsing habits of different species, there is usually increased forage production. When some plant species are removed by grazing, the remaining grasses and forbs grow at a greater rate and browsing of shrubs often increases tillering and regrowth of stems. Also, it was found that this resulted in animals eating a larger proportion of the plants which they preferred. For example, some Australian workers placing cattle, sheep and goats together on bush pasture, had the following results. Diets selected by the cattle contained less crude protein per unit of feed than diets selected by sheep, while the goat diets contained more shrubs which were unpalatable to both sheep and cattle. Some studies also suggest that this leads to fewer problems with internal parasites.

Studies with goats suggest that they have superior ability compared to other ruminants in utlizing fibre in coarse feedstuffs. This ability to utilize waste vegetation, browse plants and roughage and to convert them into milk and meat, largely accounts for the world-wide distribution of goats.

Goats probably have the highest reproductive efficiency of all domestic ruminants, with the possible exception of some sheep breeds. The components of this efficiency are high fertility (kidding percent) and a short generation interval.

The one major concern I do have regarding goats as a supplier of meat and milk in the north relative to cattle or wild animals such as the caribou, is that we have little knowledge of the animal's ability to cope with extreme cold.

I would like to relate to you some of the experiences of goat owners in northern Ontario, Alberta and North Bay have had.

1) Does are normally bred to freshen in January and February. However, in these areas, does are bred to kid in April.

2) Goats must be housed during the winter months. They can withstand temperatures as low as -40°C with no detrimental effects, if they are

kept dry and if there are no drafts. A pole barn with an open side for example, would not work due to the drafts. Goats generate very little body heat and therefore you can expect barn temperatures to be similar to outside temperatures.

3) Goats have a poor ability to collect body fat in preparation for the cold. Therefore, dietary energy requirements increase during this period. This usually means that the goats must be fed a relatively good quality leafy hay, and usually better results are attained if the animals are fed more frequently.

4) The water source for these goats must be heated.

5) Of the popular goat breeds in Canada, probably the Swiss breeds which include Saanen, Toggenburgs and Alpines are best suited to the cold climates. Nubians and La Mancha also popular breeds in the southern part of the province are tropical breeds and are more susceptible to cold temperatures.

6) The most common ailment in goats stressed (especially humid conditions) when cold, is pneumonia.

7) Goats like to eat the cones, small twigs and leaves of spruce, cedar, pine and conifers. However, in the case of pine and conifers, this practice can result in abortions. Also, any time evergreen leaves are eaten by does, the milk will assume a flavor and odor of the evergreens.

Goat milk has potential, especially in more isolated communities. It's much easier to handle, and because it is not as sensitive as some of the other milk products, it has a longer shelf life. I don't know whether we've seen the impact that this product has a potential to make in Northern Manitoba.

(Thank you)

"THE FUTURE"

MODERATOR, Hon. Doug Gourlay, Minister, Department of Northern Affairs and Municipal Affairs, Province of Manitoba

I'd like to say thank you to the panelists for their excellent presentations this a.m. I'd also like to commend the organization that has put many hours of preparation into putting this whole program together. It's been a big effort, a lot of advertising has gone into it, and a lot expected of it. I know you've had a lot of excellent speakers during the last couple of days.

As a former agricultural representative in the area, I'm somewhat familiar with the part of the northern community. Many of you will know that in 1963, after having toured the Pasquia project, reclamation was completed. The Department of Agriculture had interviewed and screened many farm applicants throughout Manitoba and Saskatchewan, and allocated land to them. In many cases, the farm people who did come at that time lacked considerable knowledge of northern agriculture - they felt that they could farm the land here in the Pasquia in a way similar to Southern Saskatchewan or Manitoba. The flag grass type of vegetation that existed at that time was difficult to manage - you couldn't just come in with a plough, and follow it up with a seeder, then come back in August and expect to harvest a crop. Many tried it, and when they came back in the fall there was no crop - it was back to grass. It took a lot of work to bring the production potential to what you see today, and I have to congratulate the farm people who are doing an excellent job of producing crops.

Most people were impressed with the stands of rapeseed and cereal grains and vegetables we saw here yesterday. This is one area that's proven itself; there are others as well.

As agricultural representative, I was invited to the Cross Lake area, a United Church minister back in that time had intereted a group of local citizens in getting into potato production. Land was available in that period. I had occasion to go in and work with the local people regarding production and storage. The main way of getting into Cross Lake was to catch the train from here, and then either charter a flight which went in several times a week. Once I went up on the train and checked with the Cross Lake Airways to see about a charter flight; it was going to cost $32.00, I believe. However, George Graham who was working with the company and is now Mayor of Waboden said: "You can go in with us this afternoon for $8.00 - we have a fairly heavy load, but we can squeeze you in." So I waited around the dock for an hour or two and I could see the load building up - there was bread, and other supplies for Cross Lake, and then there were nine weanling pigs, would you believe, waiting for the trip. I was wondering whether I should have chartered a flight. Anyway, it came time to load the plane and we managed to all get on there. Besides all this freight and groceries there were two citizens from the community who wanted a ride plus myself and the pilot - I knew we had to have a pilot. So he brought along his wife and two children and a German shepherd dog - he sat on my feet. We got airborne, and I thought we were going to run out of lake, when George Graham said "We may have to go back and unload some of this, I don't know whether we can get up or not." So we just managed to get up and of course, with 9 weanling pigs crowed into a small aircraft, the pilot opened a window to let the air circulate a bit. The dog was looking me straight in the eye, I though he was smiling, but later I found out he had gas pains. So with the smell of hogs and an upset dog, it was quite an experience.

Potatoes can be successful in Cross Lake, flowers and horticulture in most northern communities as I found out when I went to a horticulture meeting in Lynn Lake. Crops, forages, potatoes are grown in the Waboden area. That information is available through the Department of Agriculture - the man who operated that station for a number of years, Peter Braun, is still active in the community of Waboden.

I would be remiss if I didn't comment on Tom Lamb's operation in Moose Lake. My first airplane ride was with him from here to Moose Lake in July '63 - it was known then that the area would be flooded by '64 - he had to get rid of his large beef operation, and move the cattle out of the area during the winter of '63-'64. Tom was a free-wheeling, enterprising sort of individual, he figured people should get out and work with their hands. He wasn't promoting government grants; he was impressive, and had an affection about him that attracted many people. With a lot of hard work, and overcoming difficulties such as climate and insect problems, he made a successful venture into the cattle business in an area where people said it couldn't be done. I got the support of the Department of Agriculture that we should try to retain as many of those cattle as possible in the area. Tom was willing to fly ranchers from here into Moose Lake to look at the cattle - they could pick what they wanted - as a result we were able to retain 75% of them in The Pas area.

It has been said that agricultural production can work here, but there are many obstacles. I think Mr. Donahoe covered it well when he said we lack the necessary services, professional services as well as the farm implements, the telephones, and transportation.

Though I don't think politicians should become completely involved, they're necessary to overcome many of the obstacles. It will work, and the day will come when we need the production from this area. The organization is to be commended for putting it all together, to keep the machinery oiled up because some day we'll be called on to act quickly and we should be ready to go when that happens.

(Thank you)

"THE FUTURE"

MODERATOR, Hon. Doug Gourlay, Minister, Dept. of Northern Affairs and Municipal Affairs, Province of Manitoba, introduced

Paul Rennick, Head of Environmental Group, Acres Consulting
Services Ltd., Niagara Falls, Ontario, speaking on;

"LAND, WATER, WEATHER".

My father told me when I was learning to drive, that I should drive a car as if I expected the world's worst fool to come around the corner. I learned over the years he was 100% right. What he was trying to tell me is that a person has to be aware of his total surroundings, if he's going to get down the road, life is like that and so are natural resources.

To understand land and water resources, you have to examine them together and understand the combined results. To look at a single resource is dangerously simple. There's a well known discipline that tries to do that called ecology and we talk about ecosystems. Any farmer worth his salt knows that system and practices it or he wouldn't survive. I might suggest to politicians that governments have not learned that lesson very well. We set up single purpose line function agencies, such as the department of agriculture to look at agricultural problems, a transportation department to look after transportation problems, and natural resources departments, when in fact the problems are all integrated and interrelated. You need some sort of mechanism that is integrated to be able to solve the problem. Cabinet is an integrated mechanism but a lot of things have to be done before it gets to cabinet. The people in the communities have to get together, the civil servants have to get together, the industries have to get together. So by the time it gets to cabinet, politicans have had time to make decisions, to make them intelligently.

What have we learned about future action? One thing is clear - everywhere - land, water, weather data is not sufficient, we have some, but there are too many gaps, especially where people live, in the north. We need to have a comprehensive look at local sites. At first glance the province looks like there are lots of resources but we have learned that there are limitations, with soil - there are cold soils, and drainage problems. Water looks good, but there are mercury problems here and there, sediment and erosion problems. There are clays, it's causing problems with the fisheries. We have data about The Pas, it looks pretty good but what do we know about the other communities? We have to interpret from the primary stations, so we need some local sampling to find out what's happening. Where are these south-facing slopes that Hugh Fraser was talking about? Let's define them, let's get them down, let's understand them. These are future actions to be taken with respect to resources. There are local ecosites that are better for production than others - where are they? Who should manage them? How are we going to get them under better production? We can't do it in isolated departments, we have to get together on it in the community bases.

Picking out a couple of problems, mercury in water is one, and erosion is a problem in some of the rivers. There are people working on that. We don't know yet what is causing the increased mercury levels on the Burntwood River. It's not understood how it's getting there and what's happening to it; is it increasing or decreasing? We have to learn how it got there, and having understood the mess, let's not let it happen again. When the next development comes along, we're ready to mitigate it, deal with it in an intelligent manner. I would suggest we can't do it in an intelligent manner. I would suggest we can't do that right now with respect to mercury, and I emphasize that it's not a big problem in the province at this point, nothing like it is in Ontario.

Resource Management techniques Bob Harris mentioned with respect to soil and weather, you can very often, knowing what the limitations are, overcome them. We need pilot projects, we've got Waboden, maybe we need others set up. If you're serious about a commercial project, try a pilot first before throwing a lot of people into something they might not be able to handle down the road. If you change the surface of the earth, clear large areas of forest, or flood large areas, you will change the weather pattern in that area. It may increase or decrease the rainfall, increase or decrease the temperature, and that must be factored in the planning process before you do it. It could be a problem or a benefit. A large flooded area near an airport wouldn't be a good thing to do, because you're going to increase fog, cause snowdrift problems on the leeward side, and increase the temperature slightly (the latter might be a benefit).

An inventory of land and water and forest is lacking; do you know your capability for forage on crown land? Forage for wildlife, forage for domestic livestock. Have you got a good inventory of water in the province? I would suggest you haven't. All we can say is that some lakes are deep and some shallow, so we can't say what the potential is for certain areas. I'm not taking anything away from people who have been surveying lakes - they've done a tremendous job, they've got a fact book about 6" thick weighing 5 pounds, I carried it on the aircraft one day, but it still isn't enough. So you need better inventory for local areas. Then, I would suggest, using that inventory, you can arrive at some policy decisions that might make a little more sense to the local people. I would suggest a consultive principle, where you involve the person or persons who have to something, whether farmers, or processing plant operators - they should be involved in the planning of the thing itself. This is often not done. The planners sit in a back room, come up with all kinds of bright ideas, put them on someone's desk, then that person puts them on a shelf to collect dust. So we have to involve the doers in the planning and management, then we both might learn something, integrating resources and people. It it's public land you must convince the senior civil servants and politicans, and they have to get together on a departmental basis, agree to things, or you're wasting your time. If it's private you must convince the entrepreneur that he's going to put a buck in his pocket.

I started off as a forester in my 25 years of experience doing all the things that foresters do. Ways and means are more important than understanding the resources themselves. You can have the best scientific understanding in the world, but you must get people together to get some action. You need commitment within and between, an integrated mechanism with some teeth. Boy, I remember in Alberta when I worked there, we did a quick inventory of the committees in our department, 100 committees just in our own. Our people were responsible for 98 managers, 70 some odd were ad hoc - had no authority, orders-in-council, whatever. Well, it was nice recreation for us to sit around the table and talk, but nobody had to make a decision. So I would suggest that any mechanism you set up in government or elsewhere have some teeth, orders-in-council or whatever, then suddenly everybody sits to attention, because they know that if they don't do something around the table, something's going to happen and they won't get their 2¢ worth in.

"THE FUTURE"

MODERATOR, Hon. Doug Gourlay, Minister, Department of Northern and Municipal Affairs, Province of Manitoba, introduced

Ron Britton, Associate Professor, Dept. of Agricultural Engineering, University of Manitoba, speaking on:

"GREENHOUSE AND HORTICULTURE"

The wrecking crew is back. In our summary of yesterday's session, from University of Manitoba's point of view, greenhouses aren't as bright a picture as some people expected us to present. The systems are expensive with respect to energy, economics are questionable. Traditional horticulture seems to be alive and well, and there are some unusual and exciting things going on in the north looking at non-conventional techniques of producing food, at 5600 feet or whatever. The function of this panel is to look at where we're about to go. I expect, as far as conventional horticulture is concerned, on a garden scale or larger, that it will continue to grow and prosper here in the north. We were told that a lot of diffiiculties in gardening in the north have grown in folklore, and have been told of a lot of people who have been doing it successfully. I don't expect it to be a major element of the food picture in the north. It does have a social aspect, there's something rewarding about eating your own potatoes, radishes, corn, as long as you don't sit down and figure out how much it cost. Life is more than dollars and cents, and the success in the past will continue and grow.

I think greenhouses will form a significant part of the commercial agricultural element, but not till we chop the energy. Like 50-60% over where we are now. That means we need some research, and to translate information we have now into something more meaningful, in the environment in which we find ourselves. There's a bright future as long as we can lick the energy problem, and given the time and effort and opportunity, we can lick any problem. You will find that when a more energy efficient greenhouse is in place, they'll end up being sited near places that presently have what we call waste heat. It's waste because that's what we choose to do with it. I think you'll find greenhouses showing up in odd places; the top of large buildings, beside large industrial complexes, getting in the way of the main purpose of that operation which is smelting or lumber or what have you.

With respect to the future of the people, the northern community doesn't choose to act on our theories. We can sit and theorize forever and a day, government committees can meet and theorize, the only way anything's going to happen is if someone gets off his duff and does it and that's you. People in the north are noted for their imagination and ability to overcome problems. There are people here who are going to grab this thorn, lick the problems, and create viable commercial operations, as long as we can solve the technical problems of keeping the thing warm, at some kind of reasonable price.

I was told in my early days as a professor, to be cautious about how long one takes - the reason being physiological, the brain can only absorb as much as the bottom end of your spine can stand. Yours has been handling a fair bit of abuse the last couple of days so I will leave with one final plea. As a professor I sit at the university and like to deal with problems. I have a lot of colleagues who do the same thing. We're a bit bound by the way a university functions. Every hour a bell rings in the hallway and that means that one or the other of us has got to get up and go to a classroom, so everyday or so you know where to find us. It's very predictable. But what it does mean is that we're stuck there, we can't get out to various locations, particularly if it involves travel because tomorrow at 9:30 you have to be back for your 50-minute program.

But we're going to function and be useful as a university if the research we do is going to have any validity to the people who supposedly use it. We who finance it, we're going to have to relate that research to problems that actually exist. You people have the problems, and we hopefully have the capacity to wrestle with those problems and with some help can arrive at a point that will solve your problem for you and give us a warm feeling that we're doing something worthwhile.

So don't look upon us as an ivory tower, as a place you can send your children for four years so they can get a better job, don't consider the fact that we converse in 4th order differential equations. We need your input if the kind of work we're going to do will be of any value to the province of Manitoba. The province of Manitoba pays for the University of Manitoba so it makes sense that we do things of value to you. So don't sit on your hands, let us know about what your problems are and maybe we can be of a little bit more value to you.

(Thank you)

"THE FUTURE"

MODERATOR, Hon. Doug Gourlay, Minister, Department of Northern Affairs and Municipal Affairs, Province of Manitoba, introduced

> Burton Ayles, from the Freshwater Institute, Fisheries and Oceans Canada, Winnipeg, Manitoba, speaking on:

FISH

(Note from Report Editor:

> Mr. Ayles told a joke at the beginning of his presentation on the "Future". I played and replayed the tape, but the punch line is missing. Perhaps you can fill it in.
>
> "When I arrived here a day and a half ago, Sig Sigurdson told me a story about the fine garden products in The Pas region. A potato and a carrot were good friends all their lives, had grown up together. The potato was round little fellow, very calm, and the carrot was very agitated, hopping back and forth walking down the street. The potato was always concerned about this, that something was going to happen but the carrot said 'Oh, no I'm just very quick, just watch', and he hopped across the railway tracks of the CN line, caught a rootlet and fell flat on his whatever it is, and a trainful of tourists on the way back from Churchill ran over him. They whisked him off to the hospital, and the potato rolled . . .")

The average consumption of fish in Canada is relatively low, about 16.3 pounds per year. It's going up every year; when MacDonald's introduced fish sandwiches, it went up about 2 pounds a year. It's still very low compared to the North; the native consumption in Manitoba is between 40 and 50 pounds. In other areas it's even higher. In Aklavic, for example, the average family consumes over 600 pounds a year. In Cross Lake, to buy the equivalent amount of food would cost over $460 per year. In Saskatchewan, in the Churchill River basin, the cost of fish consumed per person per day is about $3.00 if they bought it in a local store. So fish is very important.

I'm going to talk about the future of fish production, local processing, new species, new products and potential for new management, potential for enhancement, lake culture, cage culture and waste heat aquiculture.

Implementing local fish processing is relatively simple biologically, just an administrative and political problem. New species biologically is not very complex in terms of commercial fishing, very easy to start harvesting. New products can be very complex technically. Stu Law referred to the growth harvest which has been developed over a number of years and will continue to do so. New management biologically is sort of an intermediate complexity. Pulse fishing is a situation where a 3 or 4 year quota of fish in a lake is harvested in a single year, then the lake is left fallow 4 or 5 years, then fished again after the fifth year. This is economically more viable than to harvest a small quota year after year. Technically it's fairly simple to implement, a government administrative process.

Enhancement is of intermediate complexity. We know what the basically biological techniques are, we have to sort out some of the social and economic techniques to make the program viable.

Lake culture is relatively simple. It has been practiced in the South and in fairly broad areas in other parts of the world, an extrapolation for the techniques for the other parts of the North.

Cage culture is also fairly straightforward, a matter of adapting techniques for the North.

Waste heat aquiculture; biologically and technically more complex, not going to be easy.

Local processing could be implemented in a very short time now if the right kind of pressure were brought to bear.

The same with harvesting new species, something that could continue now if economics were right. New products are being implemented now and will continue over a number of years. New management, the same, we have the ability to implement this kind of thing right now.

Enhancement - we're talking about a 1 to 5 year time frame, before the information is available to have new enhanced fisheries in the North.

Lake culture in the North could be implemented right now, cage culture within a 2 to 3 year time period.

For waste heat aquiculture we're talking about 5 to 10 years before the technical aspects are suitable for viable commercial operations. Who will participate in local processing? People like the freshwater fish marketing corporation, commercial fishermen, local retailers and local and provincial politicians. New species can involve commercial fishermen, local retailers, and fresh water fish marketing corporation. New products can involve commercial fishermen, also research facilities such as the Freshwater Institute. New management will involve sport fishermen and commercial fishermen, if there's re-allocation between the two, and resource managers, provincial government biologists. Enhancement is going to involve sport fishermen, domestic fishermen, commercial fishermen, their source managers, researchrs and local communities indifferent aspects.

Lake culture will be different; the types of people involved are likely to be private individuals, not necessarily commercial fishermen.
The same with cage culture, it's likely to be private individuals or community efforts such as Indian bands, other groups that may not necessarily be involved in the traditional commercial sport or domestic fishery. In waste heat aquiculture, it's likely to be private corporations with large amounts of money and large supplies of waste heat that will be involved.

Local processing will involve traditional species of fish; walleye, pickerel and whitefish, new species like suckers, carp and arctic fish now unharvested. New products will involve different ways of using traditional species, such as roe harvest from whitefish, also different means of preparing non-traditional species such as fish cakes prepared from mullet or maria. In new management the species involved will be traditional species, whitefish, walleye, pike, sport fish such as lake trout and pike. Enhancement would be walleye and possibly whitefish depending on the area. Lake culture and cage culture would be rainbow trout probably because they are the most common.

Waste heat aquiculture involves the most variety of exotic species, anything from actic char which is not now very common in Northern Manitoba to freshwater shrimp to oysters or mussels.

The final point is where will this occur? Local processing will occur in areas of the North where there is a fairly large production of fish such as La Ronge, Great Slave Lake or around the Thompson area. There's not widespread opportunity in Manitoba for completely new and unexploited stock, but throughout Manitoba and Saskatchewan there are stocks of low value fish, also in this area, and around the Mackenzie delta. New products are going to be available from traditional areas, those will come first. New management is going to be in the lakes which are now marginally economically viable, particularly pulse fishing, lakes that are small and have been fished some years only. Lakes that have transportation costs that would mean they would be fished some years and some not. Enhancement - the large lakes like Winnipeg and Winnipegosis. Cage culture - possibly South Indian Lake, Cedar Lake and outlet lakes around Lake Winnipeg. Waste heat aquiculture. I mentioned there will be areas that would be industrial sites, so there are areas at a couple of points in Northern Manitoba, and may be areas where pipelines are going to be developed. There are 2 things which would really be the limiting factors in the development of fisheries, economics and initiative. After talking to a number of people today, I decided to add a third factor - politics. That's where a lot of the decisions will be made, as to whether things are economically viable, or not viable.

(Thank you)

"THE FUTURE"

MODERATOR, Hon. Doug Gourlay, Minister, Dept. of Northern Affairs and Municipal Affairs, Province of Manitoba, introduced

* Karen Wittenburg, a dairy specialist from the Department of Agriculture, Province of Manitoba, speaking on:

"MEAT, DAIRY, FORAGE"

On talking to people here, seeing their reactions and their enthusiasm, I think there is a direction which exists here. To quote from the talk that Bob Richmond had made, one paragraph in which he says future activities are often nothing more than refinements of present experience, present experience nothing more than a repetition of past activities. If you related back to how you relate to a situation, how others have approached various situations, that is true. The openness, the willingness to take a look at other aspects, to consider other things such as wildlife, or goats, a subject you wouldn't expect to see in a program such as this one.

I think when we take a look at livestock production, the large commercial units are very dependent on the southern structure in terms of processing and marketing. There will be a period during which we will have to be weaned from a southern into a northern structure. For example, in milk production, the amount of milk brought into the north and the cost to the northern community for this milk doesn't seem to make sense. If you can produce it here, it should be, rather than brought in. But the industry is so closely tied in with what we have in the South, there always will be competition, till we have something available in the north. It's also the case in the cow-calf operation - I talked to some of the producers here, they can produce meat efficiently at low cost, but the problem is finding an outlet to market, and again having to rely on a southern market, also competing with that market. When you consider the fuel and transportation costs to bring the product into the south, the north is definitely at a disadvantage.

* Karen ably substituted, at short notice, for Dr. Bob Richmond (absent) in this segment of the programme.

In 1979 north of the 53rd parallel, 480 thousand litres of milk were produced and utilized. Roughly 1 million 500 litres were brought in from Swan River into the north to be processed and consumed in the north. Along with that another 2 million litres were brought in to be processed. For this 4 million litre total the transportation costs were 94,000 dollars, which amounts to 4.4¢ per litre. In addition there is a lot of processed milk which comes from Southern Manitoba and Saskatchewan. The overall total consumption runs 6.8 million litres in 1979.

Basically, on a seasonal program, you can expect grass for a very short period. Browse is something which wild species can use, also sheep and goats, throughout the entire year. There is a key area of forage and we must maximize utilization of this to have an efficient livestock operation. During summer forage quality peaks; this falls off during fall and winter. It's important to look at what resources we have and use them completely. In the case of cow calf, goat, or sheep operation we must use grazing to the fullest extent. It seems more important than improving genetic stocks. Joe Conley gave me some of his thoughts and I will relay them to you.

Research of the future should contain an area of variety testing, including varieties from other northern countries such as Norway, Sweden, Finland, development of active nitrogen bacteria for legume crops, development of the least costly forage establishment in the north - we're not close to the potential. Also the continuation of the least cost and maximum gain of livestock and milk production, an example being the grasslands project. Emphasis should be placed on good management of forage production, pasture management, hay production and marketing of this in the north is required - you must go through the stages. Quick services are needed for management parts, farming operations are very dependent on these to maintain high level efficiency.

Three hundred pounds of beef per acre per growing season should be a minimum goal. The average weight of a weaned calf at the end of the season should be about 400 pounds. We should expect a pasture holding of 1.5 head per acre of land.

Instead of the north being an extension of the breadbasket of the south, the goal should be that the north be self-sufficient, and not have to rely on the southern industry which is often slow in reacting to what the requirements are.

Some Socioeconomic Considerations of Intensive Wildlife Production

by

Dr. R. J. Richmond
B. C. Ministry of Agriculture

(not presented personally but included for the readers' information)

The theme of this session is The Future. There is always an inherent danger in trying to predict the spirit of the future because it is usually based on the experiences and activities of the spirits past and present. Future activities are quite often nothing more than refinements of present experience and present experience nothing more than repetition of past activities.

Any efforts directed towards developing food production schemes for the north can only expect limited success if those efforts are based on refining or modifying techniques developed in the south. Most agriculture in Canada can be classified as intensive with greater and greater dependence on fossil fuels. If northern agriculture is designed along traditional lines energy costs alone could restrict its development into any meaningful food producing scheme.

The future success of the North feeding the North will, in part, be dependent on developing completely new agricultural strategies. One such strategy is the intensive production of wildlife for food - namely the ungulate - with intensive referring to controlled rather than closely confined.

The primary reason to consider the wild ungulate as a food source is because of all the available ruminants the wild ungulate is the best adapted to survive and reproduce in northern environments without assistance or supplementation. It is somewhat ironic that our entire animal industry is presently based on animal species least adapted to our environment while a good part of our recreational industry is based on species indigenous to the environment. Utilizing wild ungulates in natural environments provides the opportunity to optimize our resources and protects against the danger of preselecting a particular technique which is socially and politically acceptable at the time but which may require a complete and irreversible dismantling of a potentially productive ecosystem.

The commercial use of indigenous species for food is not a new concept. Its role is increasing in the food producing schemes of various countries. South Africa has some 3,000 game farms (Crawford 1968). Reindeer ranching is practiced extensively in the U.S.S.R., Norway, Sweden, Finland and to a lesser extent in Alaska and the Northwest Territories (Scotter & Telfer, 1975; Stager & Denike, 1972). Fifteen hundred to 2,000 tons of meat from red deer is being sold annually in Scotland (Blaxter, 1971) and red deer harvesting in New Zealand has evolved from a form of pest control to actual farming with over 6,000 tons of venison worth $7,000,000 being exported to 28 different countries (Clouston, 1973). The U.S. has a number of game ranches which cater primarily to the recreational trade.

Outside of a few commercial bison herds there are no similar programs in Canada. This inactivity is not a reflection of lack of interest however. The last five years has seen serveral feasibility studies and reviews on the subject, and five of these originated in Manitoba.

Analysis from some of these studies, which included data from Elk Island National Park and ongoing bison and game ranches in the U.S. and Canada, show an economic advantage for the production of indigenous ungulates over cattle. On the average machinery and fuel costs were 40% and supplementary feed 25% of those for comparable cattle operations in the same environments. Cattle systems produced up to 50% more meat than systems which included a mixture of species of smaller mature weights but energy requirements per pound of carcass produced were 60% greater and energy input per pound of protein produced 250% greater than that for production of wild ungulates. On a basis of annual dollar return per dollar of initial capital investment the ratio can be 2 to 4 times greater for game ranching compared to cattle ranching.

The social benefits of commercial wildlife production are considerable. This type of production system is an energy conserver and environmentally sensitive. Studies to date indicate that wildlife production can serve both as a substitute and a supplement with other land uses such as forestry and to some extent depend on a multiple use of strategy.

Surveys have indicated that consumers would buy bison and game meat on a regular basis if it were available. The low fat and cholesterol levels in wild meat make it particularly attractive to diet conscious people.

Regulations governing the rearing, harvesting, and processing of wildlife species would have to be developed but this should not be a problem since many of the necessary regulations already exist either in wildlife or domestic lievestock legislation.

One of the main beneficiaries of game ranching schemes could be the Inuit and Indian. Wildlife production systems would be more in keeping with their cultural backgroun and life styles than is mixed farming. The spin off in cottage industries such as tanning, taxidermy and various major recreational opportunities could provide financial returns equal to that of the primary meat product.

So, if the commercial production of wild ungulates is profitable why aren't we doing it?

One reason lies in our social attitute towards wildlife in general. We consider them an article of pleasure rather than a commodity of trade. Wildlife are for looking at and shooting at; domestic animals are for eating. Wildlife are public property but less than 10% of the public ever see or use them. Domestic animals are privately owned but used continuously by most of the public.

A second reason is that most wildlife do not have a basic economic value of utility attached to them. The protectionist attitude which has attended wildlife has kept it wrapped in a cloud of emotional and almost mystical values. At the moment it is difficult to compare the potential of wild and domestic production systems. Objection to the commercial valuation of wildlife has come primarily from the very vocal hunter and protectionist groups. Ironically, by ignoring the need for a comparable economic base, these same groups could play a major role in eroding the position of wildlife in future competition for land use.

Demands on forests, minerals, food and energy sources are ever increasing. If wild ungulates are to survive the scramble for depleting resources they are going to have to secure a position of priority in the political and economic arenas equal to that of their competitors. One way to ensure that position is to elevate the status of the wild ungulate from that of an item of pleasure to a more basic staple in our food system.

The commercial production of wild ungulates has a definite potential in food strategies of the north. Hopefully the future will see governments with the courage to develop that potential.

"THE FUTURE"

Moderator, Hon. Doug. Gourlay, Minister, Department of Northern Affairs and Municipal Affairs, Province of Manitoba, introduced

Dr. Bob McGinnis, Dean of the Faculty of Agriculture, University of Manitoba, to give

"THE SUMMATION"

At the outset, let me say how pleased I am to have the opportunity to participate in this important and timely conference and to meet with so many interested and enthusiastic registrants. I believe it has been a worthwhile learning experience for all of us. I am impressed by many aspects of this conference - from the importance that has been attached to it by the various concerned constituents, including producers, government, industry, university, and media, to the amount of information already available in many production areas, and to the identification of further areas of research and development that are important to solving more specific production problems. I hope that you will forgive me if my presentation tends to be a bit rambling. It is difficult to sum up a conference with such wide ranging topics and interests and be succinct at the same time.

One of the problems that I believe we are all having is to properly visualize "what is the north". I would agree with Dr. Richmond that we are really referring more to an environment than a latitude. I grew up on a farm northwest of Edmonton at a latitude of between 54° and 55° and to me "north" was the Peace River district, but to my cousins in Calgary we definitely farmed in the "north" and in those years when an early frost took its toll, I had to agree. Of course, residents in the Peach River consider High Level and Hay River as north; and so it goes. Certainly "north" also varies from province to province. In Alberta it might start at 60°, whereas in Manitoba we may consider 53° as the boundary and even at that one could question whether The Pas is north primarily because of isolation rather than climate. Therefore, it is difficult to be consistent in our consideration of the north except to universally agree that we are concerned about that area where frost and cool weather are constant threats to production, and isolation from markets and services increase production risks and costs.

Without minimizing the major real costraints of climate and soils to production, this conference has, on the whole, presented a rather optimistic outlook for the possibility of the north feeding the north and, in fact, has probably brought to light a good deal of new information on past and present ongoing enterprises that may not have been well known previously. So, as we enter a new decade, which has been described as the "decade of uncertainties", we should also keep in mind that it might well be the decade of opportunities for the north, and it should be approached with the necessary element of optimism, as Mr. Donohoe has said, to make things happen. Optimism is the key word. How would you define an optimist? It is said that if an optimist, a pessimist and a skeptic were sitting together for a breakfast of hot cereal, the optimist would say, "Please pass the cream"; the pessimist would say "Pass the milk"; and the skeptic would say, "Pass the pitcher". At this juncture if we are not prepared to say "Please pass the cream", let us at least say, "Please pass the whole milk".

So, where do we go from here?. I believe that the time for things to happen is now. It has been already mentioned that the Agricultural Institute of Canada held its 60th annual conference in Edmonton last month and focused on the theme "Northern Agriculture". Approximately 1,200 members of ten scientific societies were involved in paper presentations and discussions on many aspects of the subject. If I sensed the general attitude of these meetings, I would rate them as quite positive. But probably the most important outcome of the meeting was that it brought into the limelight to the agricultural scientific community the past and present problems of northern agriculture and the future possibilities for introducing higher food production that would be more risk-free. Media coverage was excellent and "people" awareness of the problems and opportunities for northern food production has been greatly enhanced.

Both this conference and the AIC conference have emphasized the fact that, although a good deal of research has been initiated for several years on problems peculiar to northern food production, the total amount relative to its importance is no longer adequate, and recently there has been generally a lack of an overall co-ordinated and sustained effort. Well, never before have the agricultural problems of the north been so publicly visible in Canada.

As I mentioned earlier, this conference has been enlightening in many ways.

We have a good picture of the land area available and its potential for further development. We have been informed that animal and plant research in northern regions has been conducted for many years at many locations; the results of which have been to verify that cereal, oilseed, and forage crops can be grown rather widely and that beef and dairy cattle, swine and poultry can be raised, given modest cold weather protection. Greenhouse production of tomatoes and cucumbers, flowers, etc., has been demonstrated although the economics may be in question, and a wide range of vegetables and fruits can be grown in the home garden. Dr. Richmond indicated in his paper that there is a promising future for some species of wild ungulates. All in all, the evidence presented suggests to me that the north could feed the north now - if the economics for doing so were favourable.

It seems to me that collectively, i.e. the producers, government officials, extension specialists, agribusiness, industry, and scientists, must work hand in hand to develop the necessary research and development programs in those critical areas that will help tip the balance in favor of economic northern production. First of all, these programs must be identified according to some established priority, and here I believe the producers can play a key role. What are the major constraints to increasing production in the various food or food chain areas and what are the scientific or policy/regulatory bottlenecks presently constraining production? What are the innovators in the northern districts doing now to maximize production opportunities? We know that there are a number of successful enterprises in the region. What has past research taught us thus far? Have these results been communicated to producers effectively? How do we improve the infrastructure (telephones) to initiate those services (veterinary) and business (abattoir) so necessary to development? These are questions we must cope with.

What about areas of research? As has been mentioned, research and testing of several crops and animals has been conducted at a number of northern locations over many years. In the early 1900s, the Canada Department of Agriculture started production research at a number of locations in the northwest, sometimes with the co-operation of missionaries. In 1944, an experimental farm was established at Mile 1019 (Haines Junction) on the Alaska Highway and a second one at Fort Simpson in 1947. Research was conducted on various crops, soils, beef cattle, swine, poultry, vegetables, fruits, etc.

In summary it was found that the climatic requirements for successful crop production north of 55° latitude were: an 80-day frost-free period, a vegetative period of 110 days, an accumulation of 1,000 growing degree days, about 43°, and adequate precipitation. In 1969, the decision was taken to close these two stations. This decision was primarily taken because commercial agriculture was not following as rapidly as had been expected and, therefore, the expense could not be justified. In retrospect it is probably regrettable that these programs had not continued although at that time the decision to close could not be easily challenged. Today most of the backup research support for the northwest is centered at the Beaverlodge Research Station and associated stations at Fort Vermillion and Prince George. Most of the research results apply more directly to the Peace River district, but Bob Harris has informed us that they could be easily applied here as well.

In Saskatchewan, the Melfort Research Station has been involved in northern research, having tested numerous varieties of cereals and forages as well as fertilizer responses and other soil-related studies. At Cut Beaver, data on yields and fertilizer responses were promising. For vast areas of Northern Saskatchewan, forage and pasture production only are possible which might lead to viable animal enterprises (cow-calf) in some areas.

In Manitoba the Wabowden Station was the site of a substantial testing program, particularly in association with the Brandon Research Station and the Manitoba Department of Agriculture and Soil Survey. Unfortunately this program terminated a number of years ago also. The Pasquia Land Settlement Project also generated a good deal of useful information by determining the crops that could be grown and the fertilizer requirements of the soils. Experimentation here also wound down several years ago.

What I am trying to point out is that research on northern production problems kept pace with northern development for many years and, in fact, was phased out primarily because of a general lack of interest for any rapid increase in farming enterprises in northern regions. The economics in most cases were questionable particularly under conditions of high risk, and markets could be quickly saturated because populations were low. Transportation of produce to southern markets was costly. In any event, research on northern agriculture has gone through a ten-year vacuum period and now we find we have fallen behind the need of producers.

So, it is time to have another serious look at research programs that will improve the north's production potential. It would appear that with the dramatic increase in energy costs, the economics may be more favourable for the north feeding the north. Obviously one of the first programs that should be undertaken is in the general area of economics to get a more precise answer to this major question. However, it is also time to introduce a more vigorous campaign of varietal improvement for northern regions. By and large, breeding programs have focused on varietal development for southern regions, and there is a broad scope for developing varieties for the north that would have such features as earlier maturity, frost tolerance, day length response, drought tolerance, etc., combined with high yield.

I am happy to inform you that the University of Manitoba, in partnership with the Manitoba Department of Agriculture, and the Federal Department of Regional Economic Expansion, under an AgroMan contract, has reintroduced varietal testing of several crops in The Pas in 1980. This is a start but not a real answer to the problem of developing varieties better adapted to the north. It is time to identify who should be responsible for what, assuming we are in agreement that Research and Development in the north should be expanded. Is it time for Agriculture Canada to reactivate some of the northern research stations to provide serious leadership in solving the present day problems, not only in varietal improvement, but also in soil fertility, management practices, vegetable production, livestock and poultry production, etc.

Dr. A.A. Guitard, Director General, Western Region, Agriculture Canada, in a paper presented at the AIC meeting, made the following statement:

> ". . . we must establish a Northern Agriculture Research and Development Institute on the campus of one of our western universities that has an agriculture faculty. We must staff it with experts in soil, climate, crop and animal breeding and production, economics, marketing, human relations and a wide range of related disciplines. We must have this group bring together all of the present knowledge of the north and catalyze and co-ordinate future research on the north.

To be effective, research must be carried out in the region it is to serve. This means that a network of northern stations will be required. Reopening the old ones may be feasible, if the demand so warrants. Universities, provincial departments and other interested agencies could also play a role. But co-ordination is important. Speaking for our Faculty, we would be happy to become involved.

In the animal field, mention has been made of the domestication of wildlife. One of the exciting developments in recent years is the herd of bison in the McKenzie Bison Sanctuary in the Ft. Providence-Deep Bay region, as described by Dr. Fuller of the University of Alberta. In 1963, 18 disease-free bison were released; by March of 1980, the herd numbered about 650. In the total absence of any form of management, except protection from hunting, the rate of increase has been 23% over the past ten years. Animal scientists should undoubtedly devote some attention to this kind of an animal that can make it on its own under northern conditions. Domestic production also has good possibilities. Opportunities for increasing northern fish production are encouraging and even advertising our local product may have an immediate impact.

In summary, this conference has been very important and useful in identifying both the problems and the challenges involved in the north feeding the north. Not all the problems can be solved by research, indeed many must be addressed by governments since policy issues are involved, including very sensitive ones such as land use, marketing procedures, transportation, subsidies and other incentives. I believe that the excellent attendance and interest shown by our leaders in government, industry, and other organizations attest to the fact that there is a universal concern for northern communities and their future development. In closing, I would like to congratulate the Norman Regional Development Corporation for having organized such an excellent conference. It is my impression that it has met your expectations.

I would, however, wish to conclude by reiterating the Honourable Mr. Jobin's introductory words of advice and caution - the Norman Regional Development Corporation should continue to take the lead in promoting the necessary programs to fulfill the dream of the theme of "The North Feeding the North".

(Thank you)

RESOLUTIONS

The concluding session on Resolutions was chaired by Mr. Lyle Walsh, an Alderman of the City of Thompson and a director of Norman R.D.C.

1. Moved by A. McWilliams
   Seconded by Grant Wright

   WHEREAS food production and the future of families who want to get off their "butts" and produce food is directly dependent on the availability of suitable land;

   THEREFORE BE IT RESOLVED that ALL land north of 53° capable of growing food stuffs be made readily available by the Provincial Government for occupancy and development for production for which it is best suited.

   Carried

2. Moved by Martin Playford
   Seconded by Anne Bateman

   WHEREAS northern agriculture is presently handicapped, and;

   WHEREAS large tracts of Crown land are being directed by different government departments with varying mandates;

   BE IT RESOLVED that suitable Crown lands be made available for purchase for agricultural purposes, and;

   THAT a sales policy be developed, to be under the direction of ONE department, the Department of Agriculture.

   Carried

3. Moved by Alfred R. Head
Seconded by Margaret Head

WHEREAS there has been a growing market for wild rice, and I am informed that wild rice farming has been quite successful in Southern Manitoba;

THEREFORE I am now requesting that funds be made available for a feasibility study on the development of wild rice farming in our Northern lakes.

Carried

4. Moved by E. Voyer
Seconded by J.P. Bodnar

BE IT RESOLVED that a serious look be given into the feasibility of a large scale chicken farming and egg producing plant in The Pas area and that the results be made known to the interested party;

The Northern market has a need for 5,000 fryers per week and 2,000,000 dozen eggs per year. With these figures in mind I feel that a local co-operative could be formed to get this program off the ground and into a successful venture.

Carried

5. Moved by Chief Charles G. Constant
Seconded by Oscar Lathlin

WHEREAS The Pas Indian Band owns four tracts of land within the Saskram area.

WHEREAS the provincial government has a practice of designating land around Indian lands as provincial parks, wildlife management areas and/ or other land use without giving due consideration to adjacent lands owned by The Pas Indian Band. Members of The Pas Indian Band traditionally have received very low priority in terms of land use development. It has always been the Native people who have had to sacrifice the traditional use of the land and causing the loss of their lifestyle.

WHEREAS the Chief, Council and the general band membership of The Pas Indian Band are interested and will support the concept of the "North Feeding the North" provided that the implementation of such a concept takes in all aspects of development and not only in the field of agriculture.

WHEREAS The Chief, Council and the general band membership of The Pas Indian Band supports the concept of further development of the agricultural industry around The Pas area, particularly west of the town provided that the development is carried within the area south of Carrot River and not into the Saskram area.

WHEREAS Members of The Pas Indian Band have seen over the years resource development taking place right in their own backyard and then having to pay exhorbitant prices for the finished product. This is in reference to the hydro development which produces cheap electricity in the north shipping it all the way to Winnipeg and then having to buy from Winnipeg at prices which are higher than what they are in the south.

WHEREAS The Chief, Council and the general band membership of The Pas Indian Band are interested in resource development in co-operation with other groups provided that they have input into the development right from the start and not when the development is already at the implementation stage.

WHEREAS Members of The Pas Indian Band are confused as to the ultimate motive for staging such a conference in The Pas. A great emphasis is placed in the area of agriculture and not on other areas.

WHEREAS The Pas Indian Band and other member bands of the Swampy Creek Tribal Council have filed a Statement of Claim against the province of Manitoba and Manitoba Hydro for the provincial government's failure to fulfill promises made to the Indian people of the affected bands during the Grand Rapids Hydro Installation.

WHEREAS The Pas Indian Band has previously gone on public record opposing the conversion of Saskram into an agriculture area.

THEREFORE BE IT RESOLVED THAT The Pas Indian Band hereby re-emphasizes to this conference its continued opposition to any type of conversion of the Saskram area.

Not Carried

6. Moved by John Bodnar
Seconded by Mr. McCracken

WHEREAS The Council of the Local Government District of Consol believes that sound and prosperous agriculture is vital to Northern Manitoba's economy;

AND WHEREAS the prosperity of the entire province is dependent upon agriculture to a marked degree;

AND WHEREAS the interests of agriculture, other industries, and labour are inter-dependent and a full understanding of each on the part of the other is necessary for an economic balance;

AND WHEREAS the existing shortage of good land with high soil fertility is the most important problem facing the local agricultural producers in the Pasquia settlement;

THEREFORE BE IT RESOLVED THAT the Council of the Local Government District of Consol rquests Norman Regional Development Corporation to continue in its endeavours to promote the "North Feeding the North" concept.

Carried

7. Moved by H. Abrahamson
Seconded by J. Rutley

WHEREAS it is deemed by this conference to be of vital importance that all pertinent aspects of food production and their development be followed up on a continuing basis, and;

WHEREAS it is deemed by this conference to be of vital importance that all pertinent aspects of food production and their development be followed up on a continuing basis, and;

WHEREAS it is deemed that the Norman Regional Development Corporation is the logical organization to implement such follow-up;

THEREFORE BE IT RESOLVED that the Norman Regional Development Corporation be requested to strike a committee to follow through the various aspects of food development in the Northern areas of Manitoba.

Carried

8. Moved by H. Abrahamson
Seconded by J. Rutley

WHEREAS this conference deems it of vital importance to further the development of food production in Northern Manitoba and;

WHEREAS additional and ongoing experimentation is necessary to such development, and;

WHEREAS experimental farms have proven to be of paramount importance in agricultural development in Canada;

THEREFORE BE IT RESOLVED THAT the Norman Regional Development Corporation request the Provincial and Federal Departments of Agriculture to establish a full-scale experimental farm north of the 53rd parallel.

Carried

9. Moved by B. Winner
Seconded by James Bartlett

While we have appreciated and enjoyed this conference, we, of Gillam, would like Norman Regional Development Corporation to take a greater look into the "further" north, past Thompson. We would ask that you check into upgrading transportation to the north (see open letter to Transport Canada from our (Gillam) Chamber of Commerce) supplying us with our food supplies (bakery no longer baking bread, meat market closed for two weeks, and running out of milk supply for the town on more than one occasion.)

We have heard that the "doers" have to get busy and "do" and the "squeaky wheels get the grease"! Gillam is DEFINITELY the North and does belong to Norman Development Corporation and we are asking that you look into our problems and try to help us improve our conditions as citizens of the North.

Carried

10. Moved by Alfred R. Head
Seconded by A. Kirkness

Our Northern Manitoba barren land caribou are disappearing rapidly;

Therefore I am requesting that a feasibility study for development and domesticating of our barren land caribou, for the use of our northern residents, be implemented.

Carried

11. Moved by L. Farand
Seconded by Paul Burelle

WHEREAS the Province of Manitoba is a basin province, east of Alberta and west of Ontario, with several large rivers and streams emptying into

Lake Winnipeg and other contributories that are dependent upon producing human food, both in agriculture and fish protein, and;

WHEREAS the United States Government has not made any public commitment assuring the people of the Province of Manitoba, and particularly the food producers, that the diversion of the water from Garrison Dam will not carry any contamination towards destruction of our food chain;

THEREFORE BE IT RESOLVED THAT the Norman Regional Development Corporation make every effort to get some assurances from the American Government that no further plans of developing the diversion be implemented until alternatives could be found.

Carried

12. Moved by Stan Wilson
Seconded by Barry Vincent

THAT the wilderness areas of Canada be maintained by legislation and the wisdom of the inhabitants as sources of edible animals and edible plant life;

FURTHER THAT these food sources could be harvested for use in these areas and for sale in larger urban centers;

FURTHER THAT present legislation be amended to allow sale of wild foods in markets and restaurants, as is done in almost every European country;

FURTHER THAT the native peoples be the principle harvesters of these resources as this could be an ideal source of income for the peoples.

Carried

13. Moved by Bill Cordell
Seonded by R. McCleverty

WHEREAS fishing products can play a vital primary and secondary (waste products) role in northern self-sufficiency, and;

WHEREAS the commercial potential for fishing operations in northern Manitoba has never been fully realized because of high freight rates;

BE IT RESOLVED that Norman R.D.C. make strong representations to appropriate agencies and individuals to examine ways and means of insuring that inter-community transportation costs for Northern communities are equitable and fair in comparison with rates elsewhere.

Carried

14. Moved by Edward Head
Seconded by Alfred Head

WHEREAS because of the annual income loss to commercial fishermen in Northern Manitoba and the alarming decrease in lake trout for rod and reel fishery as a result of almost complete annihilation of lake trout by the bottom fish feeders in the present restricted waters reserved exclusively for rod and reel only, and;

WHEREAS the Norman Regional Development Corporation recognizes the fishing industry as a vital element both for supplying fish food and Northern Manitoba economy, and;

WHEREAS we feel confident that unnecessary losses to lodge operators, rod and reel fishermen, through multi-purpose fishery can be avoided by the fullest co-operation between all agencies;

THEREFORE BE IT RESOLVED that all lakes presently opened exclusively for rod and reel be immediately re-opened for gill net fishing for the purpose of producing and supplying fish for local consumption. This multi-purpose use of rod and reel and gill net fishery will provide a balance of fish populations of the carnivorous and the non-carnivorous resulting in a healthier fishery operation.

Carried

15. Moved by Blake Donohoe
Seconded by Peggy Wilson

THAT private phone lines be installed in the Carrot River Valley and upgraded in the L.G.D. of Consol area.

Carried

16. Moved by Peggy Wilson
Seconded by B. Donohoe

THAT a large-animal veterinary clinic be located on a full-time basis in The Pas.

Carried

WORDS FROM THE PRESIDENT

Because of the ever-increasing transportation costs facing Canadians in the 80s, the Board of Directors of Norman Regional Development Corporation foresee the conditions arising when it will be cheaper to grow most of our own food in the north than to pay for fuel to transport it from outside. In this regard, Canada may have to return to the same kind of regionalism we knew decades ago.

We are very grateful to the Manitoba government, the universities, the mining companies, and the panelists for joining with us to take an inventory and examine the opportunities. We hope entrepreneurs will come forward to grasp those opportunities.

We expect that the transcripts and video tape recordings of the conference will be available for the widest distribution, especially to all the communities of the north. We must ensure that we follow up on what we learn.

Mrs. Isabell Turk, President
Norman Regional Development Corporation

THE NORTH FEEDING THE NORTH CONFERENCE
The Pas, Manitoba - September 4 & 5, 1980
REGISTRATION LIST

*(P) = Panelist

Abbott, C., Winnipeg
Abrahamson, H., Flin Flon
Anderson, Mr., Leaf Rapids
Anderson, Mrs., Leaf Rapids
Arnal, A.G., Ste. Rose
Atkin, B., Arborg
Ayles, B., Winnipeg (P)
Baldwin, B., Winnipeg
Baptie, Sheila, Points West (media)
Bartlett, J., Gillam
Bashford, G., Winnipeg
Bateman, A., Snow Lake
Beardy, J., The Pas
Beardy, P., The Pas
Beck, V., Flin Flon
Bell, N., Dauphin
Berg, M., The Pas
Bergman, N., Winnipeg
Bernstrom, P., The Pas
Bighetty, B., The Pas
Bisson, L., Thompson
Blisner, F.D., Winnipeg
Bodnar, J., L.G.D. Consol (P)
Boehm, W., Thompson
Bond, D., Rockwood
Boyle, H., Winnipeg
Brandt, Carol, Points West (media)
Bridge, J., Flin Flon (media)
Britton, Dr. R., Winnipeg (P)
Brown, D., The Pas
Bruederlin, B., Winnipeg
Buck, D., The Pas
Burrelle, P., The Pas
Butcher, H. (Mrs.), The Pas
Butcher, J., Winnipeg
Callander, W.K., Flin Flon
Campbell, A., The Pas
Campbell, E., Norway House
Campbell, L., The Pas
Campbell, R., Rockwood
Carlson, W., Prince George, B.C.
Carriere, A., Waterhen
Ceplis, D., Thompson
Champagne, A., Gillam
Chanas, K., Thompson
Charron, G., Snow Lake
Chell, D., Snow Lake
Clement, B., Thompson
Columb, J., Pukatawagon
Constant, C., The Pas
Cook, D., Thompson
Cooper, G., Dauphin
Cordell, B., Pikwitonei
Coutts, Mr., Wanless
Cowan, J., Churchill
Cudmore, W.E., The Pas
Dabrowski, G., The Pas
Davidge, S., Winnipeg
Davidson, D., The Pas
Davis, S., The Pas
Desrocher, R., Ottawa, Ont.
Dobson, T., Flin Flon (media)

Donald, J., Cranberry
Donohoe, B., Brandon (P)
Donohoe, E., Brandon
Downey, Hon. James, Winnipeg (P)
Doyle, J., Winnipeg (media)
Drysdale, R., The Pas
Dubienski, P., Winnipeg
Ducharme, M., Cormarant
Dutkiewicz, D., The Pas
Edwards, R., Winnipeg (media)
Farand, L., The Pas
Fast, H., Winnipeg
Feeny, J., Winnipeg (media)
Filmon, G., Winnipeg (P)
Forbes, J.O., Winnipeg
Forth, T., Toronto, Ont.
Fraser, W., Flin Flon (P)
Frazer, H., Winnipeg (P)
Frazer, S., Winnipeg
Frechette, Mr., The Pas
Friesen, G., Winnipeg
Friesen, P., The Pas
Friesen, P., The Pas
Garrioch, S., Cross Lake
Geddes, M., Leaf Rapids
Ghostkeeper, B., The Pas
Gourlay. Hon. Doug, Winnipeg (P)
Gregoire, W., Flin Flon
Guest, E., Winnipeg
Hall, F., Wabowden
Harapiak, H., The Pas
Harmon, S., Flin Flon
Harris, B., Sidney, B.C. (P)
Harvey, M., The Pas (media)
Hay, R., The Pas
Hayden, W., Winnipeg (P)
Head, A. (Mrs.), Cranberry
Head, A., Cranberry
Heale, Ellen, Sudbury, Ont. (P)
Henry, D., Dominion City
Henry, D., The Pas
Hews, C., Thompson
Hildebrand, W., Consol
Hindson, Denny, Thompson
How, D., Flin Flon
Howard, R., Beausejour
Hrynkow, R., Winnipeg
Hudek, E.P., Winnipeg
Hudek, J., Winnipeg
Hudek, Mrs., Winnipeg
Ingvardsen, R., The Pas
Ireland, B., Winnipeg
Jaeb, L., The Pas
Jebson, J., The Pas
Jensen, S., Winnipeg
Jobin, The Hon. F.L. (Bud) Wpg.
Johanson, E., The Pas
Johnson, Wayne, Flin Flon
Johnston, Hon., J.F., Wpg. (P)
Johnston, T.R., The Pas
Keil, L., Rockwood
Kelly, G.F., The Pas
Kelly, G.F., Winnipeg
Kennedy, J., The Pas
Kernaghan, Geo., Churchill
Klassen, M., Winnipeg
Kneale, J., Winnipeg
Koncan, A., The Pas
Kraft, D., Winnipeg (P)
Laine, W.H., The Pas
Lamb, Dennis, The Pas
Lambert, S., The Pas
Lathlin, O., The Pas
Latimer, H., Lynn Lake

Lauvstead, D., The Pas (media)
Law, L., Cranberry
Law, S., Winnipeg (P)
Lawrence, A., Winnipeg (media)
Lazowski, J., Winnipeg (media)
Leblanc, E., Halifax, N.S.
Lee, N., The Pas
Leroux, D., Winnipeg
Leroy, L., Pukatawagon
Lesann, A., The Pas
Long, K., Winnipeg
Lowrey, B., Thompson (media)
Ludger, F., Meadows Portage
Lyon, Hon. Sterling, Winnipeg (P)
MacEwan, Hon. G., Calgary, Alta. (P)
MacMaster, Ken, Thompson (P)
MacMillan, B., Winnipeg
Madrigga, F., The Pas
Maksymetz, D., The Pas
Marshall, Paul, The Pas
Mattie, T., Winnipeg (media)
Maytwayshing, O., The Pas
McBride, D., The Pas
McCannell, J.E., Winnipeg
McCormick, Flin Flon (media)
McCracken, R., Consol
McEwan, T., Winnipeg
McGinnis, Dr. R.C., Winnipeg (P)
McKay, W.R., Winnipeg
McKenzie, R., Thompson
McLavery, B., Thicket Portage
McLean, Wm. C., The Pas
McLeod, A., Cross Lake
McNair, V., Winnipeg
McPhedran, Dr., Winnipeg
McWilliams, A., The Pas
Mellish, P., Thompson (media)
Miller, I, The Pas
Milton, A., Winnipeg
Moar, E., The Pas
Morrisseau, J., The Pas
Morrisseau, M.J., Crane River
Moule, T., The Pas
Mowatt, D. Riverton
Murphy, Rod M.P., Thompson
Nabess, J., The Pas
Nagle, B., Cormarant
Nelson, S., The Pas
Nelson, S., Dominion City
Nichol, L., The Pas
Novak, S., Flin Flon
O'Brien, D., Flin Flon (media)
O'Hara, E., Cranberry
O'Hara, S., Cranberry
Oerodnick, S., The Pas
Olson, J., The Pas
Parker, S., The Pas
Pearson, J., The Pas
Perepeluk, W., Lynn Lake
Petryk, C., Cranberry
Pielak, J., The Pas
Pielak, P., The Pas
Playford, H., The Pas
Playford, M., Snow Lake
Porter, W., Winnipeg
Portree, J., Winnipeg
Premachuk, E., The Pas
Procyshyn, L., The Pas
Quast, C., Winnipeg
Read, D., Winnipeg
Reicher, G., Winnipeg
Reichert, W., The Pas (media)
Reid, R., The Pas
Rempel, E., Winnipeg

Rennick, P., Niagara Falls, (P)
Richards, R., Camperville
Richmond, B., Kamloops, B.C.(P)
Robinson, M., Thompson
Roeland, R., Ile des Chênes
Rosenfeld, P., La Ronge, Sask.
Ross, G., Cross Lake
Ross, J., The Pas
Roulette, R., The Pas
Rutley, J., Flin Flon
Salahub, J., Flin Flon
Sandercock, T., Winnipeg
Saunders, C., The Pas
Schweitzer, D., Northern Sask.
Scott, D., The Pas
Semaniuk, M., Snow Lake
Sevenhuysen, Dr., P., Winnipeg
Shamray, D., The Pas
Sharpe, J., The Pas
Sigurdson, J., Winnipeg
Sinclair, Chief M., Pukatawagon
Skrypetz, S., Morden
Smith, B., Winnipeg (P)
Smithies, A., Thompson
St. Jacques, C., The Pas
Stengard, D., The Pas
Stensgard, C., Leaf Rapids
Stevens, W.C., The Pas
Stewart, D., Winnipeg (P)
Stewart, F., The Pas
Stowman, G., The Pas (media)
Swan, A., The Pas
Sweeny, R, Cross Lake
Taylor, G., Winnipeg (media)
Taylor, K., Toronto, Ont.
Taylor, R., The Pas
Terrien, D., Swan River
Thomason, R., The Pas
Thompson, A., Thompson
Thompson, L., Winnipeg
Thorne, J., Pikwitonei
Totte, J., The Pas
Trapp, A., The Pas
Tsukomoto, J., Winnipeg (P)
Turk, I., L.G.D. Consol
Unfried, B., The Pas
Vandekerckhove, L., Rockwood
Vercaigne, G., Brandon (P)
Vercaigne, L., Brandon
Vincent, B., Winnipeg
Voyer, E., The Pas
Wade, N., The Pas
Wallace, M., Winnipeg
Walsh, Lyle, Thompson
Watson, D., Regina (media)
Webb, S., Winnipeg
Weibel, D., Winnipeg
Whittaker, D., The Pas
Wilke, M., Lynn Lake (media)
Wilson, H., The Pas
Wilson, Peggy (The Pas)
Wilson, Stan, The Pas (P)
Wilson, T., Winnipeg
Winner, Betty, Gillam
Winner, Mr., Gillam
Wittenburg, K., Winnipeg (P)
Wright, B., The Pas
Wright, G., Thompson (media)
Zabrodski, T., The Pas (media)